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Mechanical Engineer

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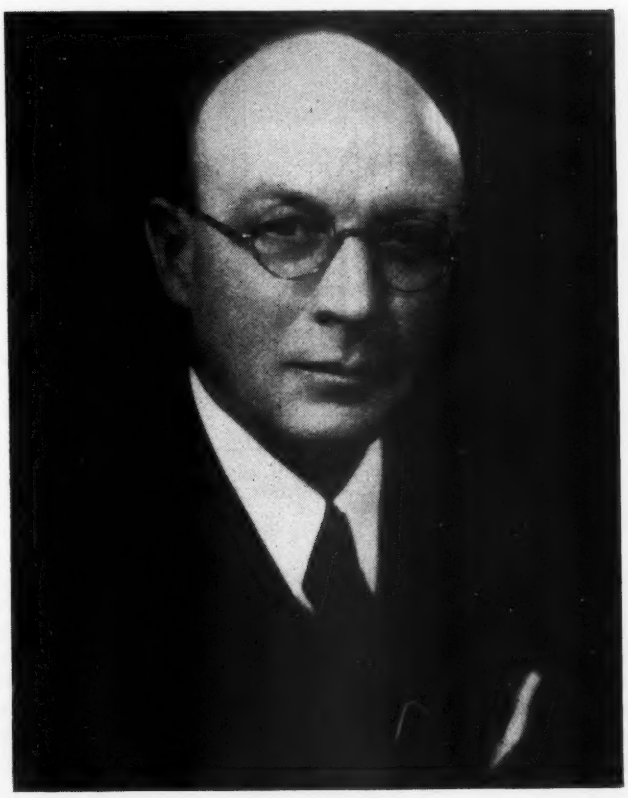
A Message to the Railroad Industry

by Herman H. Lind*



THERE were few mechanical men connected with railroads who visited the Machine Tool Exposition in 1929 that did not then see many tools which they felt could replace to great advantage those they were using. The intervening six years of depression have accentuated this condition tremendously for two reasons.

First, the purchase of new tools by railroads has been greatly retarded; in fact, in most cases has been kept to a minimum in the interest of conserving cash.

Second, the design of new machine tools has advanced almost without parallel in the same period of time.

Machine Tools Greatly Improved

The machine tool builder with little business on hand found it necessary to retain his highly skilled designers and mechanics through the depression. He therefore used them to effect desired improvements not possible of execution in busy periods, accommodating machines for the use of the newest tool steels, making possible greater production and accuracy.

Much comment has been made by economists and writers regarding the unusual upturn of machine tool orders in the last ten months and the fact that this particular heavy industry should be leading. To those who have been watching trends of the times this is not so surprising. In the manufacturing industries shorter hours and higher wages per hour have been taking a definite direction. It is also clearly recognized that products must be better as people become more acquainted with the goods they buy; also, prices which they are willing to pay must be relatively low. These ends can be accomplished only through efficient management and better processing and methods—all of which necessitate the best in machinery.

For a period of ten consecutive months, with the exception of one month, the domestic sales of the Machine Tool Industry have risen (see chart). Back of all this seems to be the matter of competition—competition for the consumer's dollar, competition among industries in which there is the question of whether the consumer can be prevailed upon to purchase a new automobile, a refrigerator, a vacuum cleaner or all of these conveniences; also, competition among individual companies, each striving to give the most for the dollar.

Costs Must Be Reduced

Until a few years ago the railroads were, with the exception of other railroads, practically without direct competition. Recently, however, competition has risen from several directions—waterways, long distance trucks, passenger cars and lately, airplanes. If the experience of other industries which have been subjected not only to direct competition but also competition with other

* General Manager, National Machine Tool Builders' Association.

industries is any criterion, the railroads will find it necessary to meet outside competition in the same way as have these industries. While the railroads naturally attempt to correct the unfair conditions due to restrictions placed upon them and not upon other forms of competition, it is necessary that they practice all the economies and efficiencies possible.

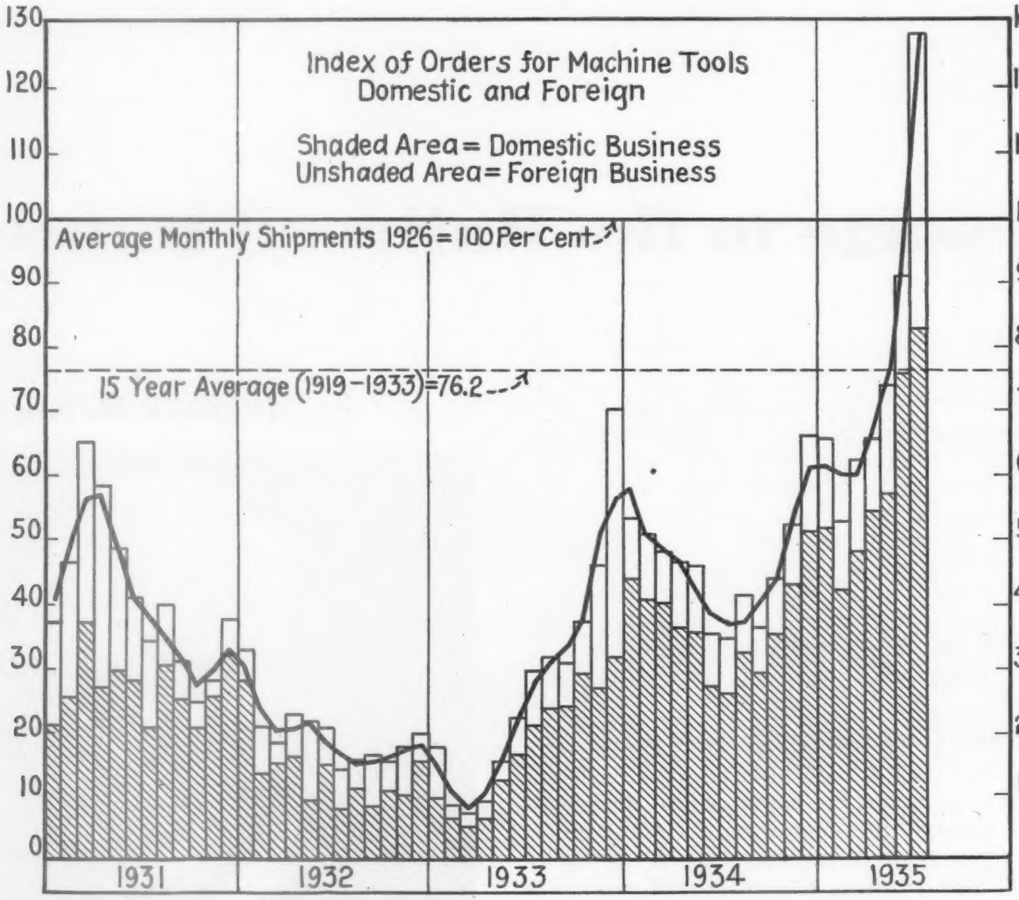
There is one substantial difference from the management standpoint between the manufacturing industry and railroad operation for which it is well worthwhile to make allowance. The main business of a railroad

been developed over the last several years indicate that considerably more work can be accomplished with the same number of men, a direct saving per piece.

Second, the upkeep of old machinery is many times that of new, frequently in itself costing more than the depreciation on new machinery.

Third, the expense due to breakdown of old machinery which holds up needed repairs can be avoided.

Fourth, the faster work possible with modern tools means a very much less layup time of rolling stock during repairs.



NOTE: From 1919 to 1933 Inclusive the curve represents the index of machine tool orders compiled by the National Machine Builders' Association adjusted to 1926 base. Beginning with January 1934 orders for forging machinery are included.

is to carry freight and passengers while the railroad shop is a service department. An individual railroad is a far-flung unit with its roundhouses and shops scattered along the entire line, while in most manufacturing industries all operations are centered ordinarily in one or a few plants. This means that the controlling management of a railroad is naturally farther away from the details of plant operation than is the manufacturer. It is probably for this reason that one so frequently finds the mechanical men in great want of equipment for their shops.

Many Savings Possible

The Machine Tool Show therefore is planned to interest not only the mechanical men but the general executives of the railroads as well. A visit to the Show and the roughest comparison of the machine tools seen there with those now in use in the shops will suggest great savings in the maintenance of equipment, and savings possible in many directions.

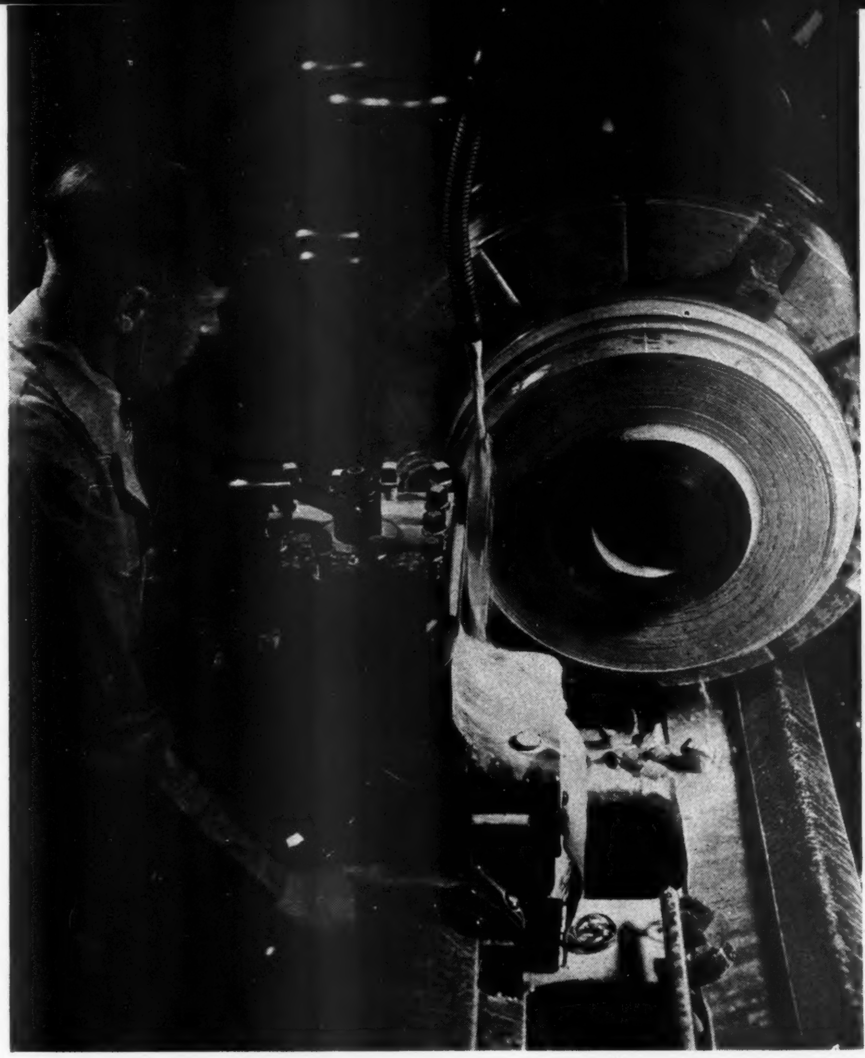
First and foremost, the new machines which have

Fifth, the greater accuracy possible on wearing parts permits longer life of equipment between repairs.

These are considerations taken into account constantly where manufacturing is the prime business.

Demonstrations on Railroad Day

In order that railroad men may more thoroughly view the improvements achieved in machine tools, the exhibitors are making special preparations to illustrate to railroad people at the Machine Tool Show some of the accomplishments of modern machinery which indicate tremendous savings. While every day of the Show will be of great interest to railroad men, Friday, September 20, has been set aside as Special Railroad Day. On this day various exhibitors will demonstrate on railroad jobs specifically what modern machine tools can do in the promotion of greater efficiency and the lowering of costs in railroad shops. Railroad men will not only be able to see machine tools at work on railroad parts but will find splendid examples of what is being done to meet the machinery requirements of other industries.



1935 Machine Tool Show

WHEN the doors of the Cleveland Public Auditorium open at 9:00 a. m. on September 11, it will mark the beginning of what is expected to be the most extensive machine tool exhibition ever held—the first in this country since 1929. Here, for ten days ending with September 21, mechanical department executives, shop superintendents, supervisors and others whose duties bring them into contact with shop operations, will be afforded an opportunity to review six years of progress in the design of machinery and shop equipment. This display will be spread out over a quarter of a million square feet of floor space and will include over 900 metal working machines of 600 types, all in operation. These, together with the exhibits of small tools, gages, accessories and shop equipment, will represent a value of over $4,000,000.

That this show holds much of interest for railroad men is indicated by the fact that of more than 110 machine tool manufacturing companies having space, an analysis of the list shows that 75 companies are well known in the railroad field and will have in operation at the show the most efficient machines which their engineers and craftsmen have been able to produce, as the industry's contribution to the cause of better shop workmanship and lower costs. In addition there are over 100 more exhibitors of small tools, accessories and shop equipment.

Machine Tool Congress

Machine tool production problems and machine shop practices will be analyzed and discussed by experts during the course of the sessions of the eight-day Machine Tool Congress to be held each evening in conjunction with the Machine Tool Exposition. The meetings, a program of which follows, will deal with such subjects as metal cutting with modern machines and tools, surface finishing, rust-proofing and welding, and will be conducted under the direction of the American Society of Mechanical Engineers, Society of Automotive Engineers, American Society of Tool Engineers, the Cleveland Engineering Society and the National Machine Tool Builders' Association. The purpose of these meetings is to provide a forum wherein engineers, users and producers may discuss freely all questions of mutual interest concerning the design and utilization of machine tools.

(Continued at bottom of next page)

Program of Machine Tool Congress

Wednesday Evening, September 11

Under the direction of the
Machine Shop Practice Division, American Society of Mechanical Engineers
Hotel Statler

8:00 p.m. Presiding Officer: Philip E. Bliss, president, Warner & Swasey Company.
President's Address. C. R. Burt, president, Pratt & Whitney Co.
Surface Finishing by Cylindrical Grinding, by Howard W. Dunbar, manager, Grinding Machine Division, Norton Company, Worcester, Mass.
Internal Surface Finishing, by A. W. Schneider, Heald Machine Company, Worcester, Mass.

Thursday Evening, September 12

Under the direction of the
Machine Shop Practice Division, American Society of Mechanical Engineers
Hotel Statler

6:30 p.m. Informal dinner. Presiding officer: McRea Parker, Director of Schools, Cleveland, Ohio.
Machine Shops in Nazi Germany, by Kenneth H. Condit, editor, American Machinist.

8:00 p.m. Presiding officer: James H. Herron, consulting engineer, Cleveland, Ohio.
Cemented Carbide Cutting Material, by Roger D. Prosser, Thomas Prosser & Son, New York.
Modern Metal Cutting—motion pictures taken through the microscope, showing the action of a cutting tool in removing a chip, by Hans Ernst, Cincinnati Milling Machine Company, Cincinnati, O.

Friday Evening, September 13

Under the direction of the
American Society of Tool Engineers
Hotel Statler

6:30 p.m. Informal dinner. Presiding officer: R. M. Lippard, president, American Society of Tool Engineers.

8:00 p.m. Standardization of Machine and Tool Data, by A. H. d'Arcambal, consulting metallurgist, Pratt & Whitney Company. (This discussion will cover the requirements of tool engineers, tool specifiers, and tool designers when specifying and tooling a machine for production.)

Tuesday Evening, September 17

Under the direction of the
National Machine Tool Builders' Association
Hotel Cleveland

7:00 p.m. Formal dinner in honor of foreign visitors to the Machine Tool Show.
Presiding officer: F. H. Chapin, president, National Acme Company, Cleveland, Ohio.

Wednesday Evening, September 18

Under the direction of the
Production Activity, Society of Automotive Engineers
Hotel Statler

8:00 p.m. Presiding officer: Joseph Gerschelin, Detroit technical editor, Automotive Industries.
Methods of Finishing Transmission Gears, by S. O. White, chief engineer, Warner Gear Company, Muncie, Ind.
Application of induction heating in automotive production, by E. L. Bailey, electrical engineer, Dodge Brothers Corporation, Detroit, Mich.
Rustproofing and Paint Adherence Technique, by F. P. Spruance, American Chemical Paint Company, Ambler, Pa.
Resistance welding in the automotive industry, by J. A. Weiger, P. R. Mallory & Co., Indianapolis, Ind.

Thursday Evening, September 19

Under the direction of the
Production Activity Section, Society of Automotive Engineers
Hotel Statler

7:00 p.m. Informal dinner. Toastmaster: V. P. Rumely, vice-president, Society of Automotive Engineers.

8:15 p.m. Presiding officer: A. T. Colwell, director of engineering, Thompson Products Company, Cleveland, Ohio.
A Quick Trip to the Machine Tool Show.
Where Are We Going from Here?, by William B. Stout, president, Society of Automotive Engineers, and president, Stout Engineering Laboratories, Dearborn, Mich.

Friday Evening, September 20

Hotel Statler

8:00 p.m. Presiding officer: C. R. Burt, president, Pratt & Whitney Company, Hartford, Conn.
Business meeting of the Machine Tool Congress.

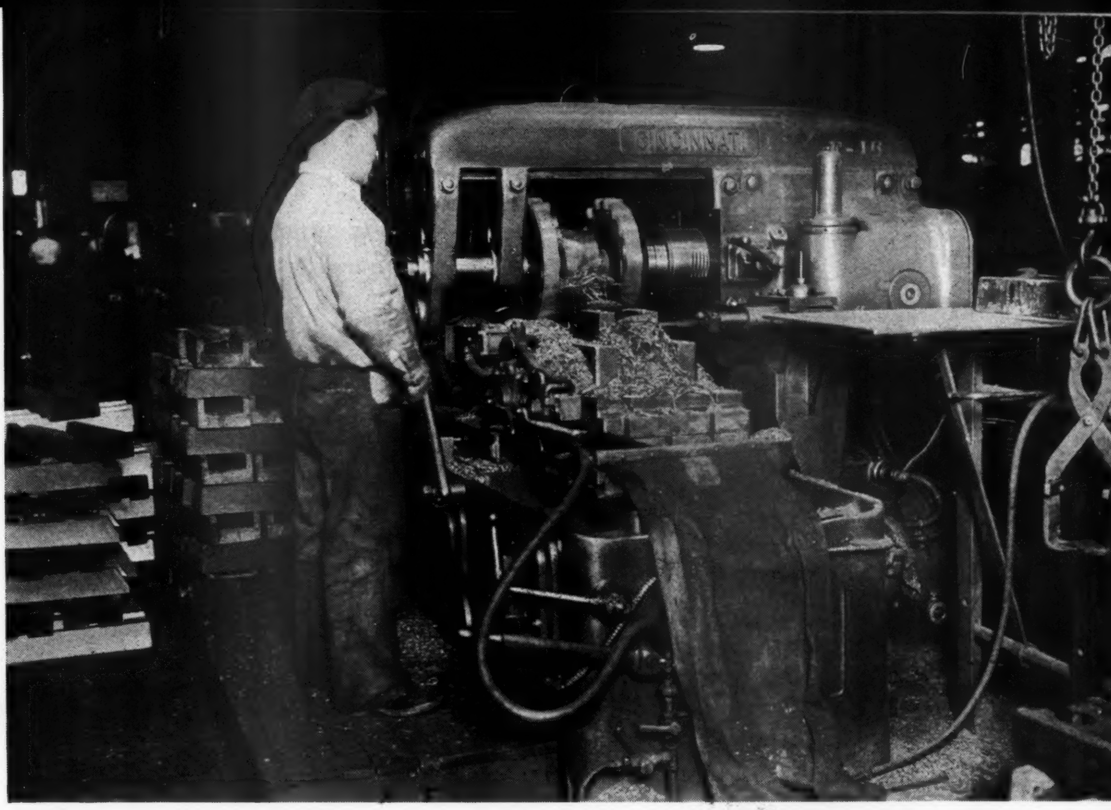
(Continued from preceding page)

Railroad Day

An innovation at this year's Machine Tool Show will be the designation, by the Exposition Committee, of Friday, September 20, as Railroad Day in honor of the railroad officers and supervisors who plan to attend. Several exhibitors will, on that day, set up their machines with railroad job operations, so that visitors may have an opportunity to learn at first hand what a modern machine can do on familiar work by comparison with the tools now in service in railroad shops. Many of the accessory, small tool and equipment exhibitors plan demonstrations on that day, of special interest to railroad men.

The show is under the direction of the Exposition Committee, the members of which are W. P. Kirk, vice-president, Pratt & Whitney Company, Hartford, Conn., chairman; George L. Erwin, Jr., sales manager, Kearney & Trecker, Milwaukee, Wis.; J. G. Hey, vice-president, Avey Drilling Machine Company, Cincinnati, Ohio; Norman D. MacLeod, president, Abrasive Machine Tool Company, East Providence, R. I.; and W. E. Whipp, president, Monarch Machine Tool Company, Sidney, Ohio. Charles J. Stilwell, vice-president, Warner & Swasey Company, Cleveland, Ohio, is president of the association.

modern milling machine



Cincinnati Hydromatic milling machine set-up for finishing cast-iron wedges

Replaces Three Obsolete Planers

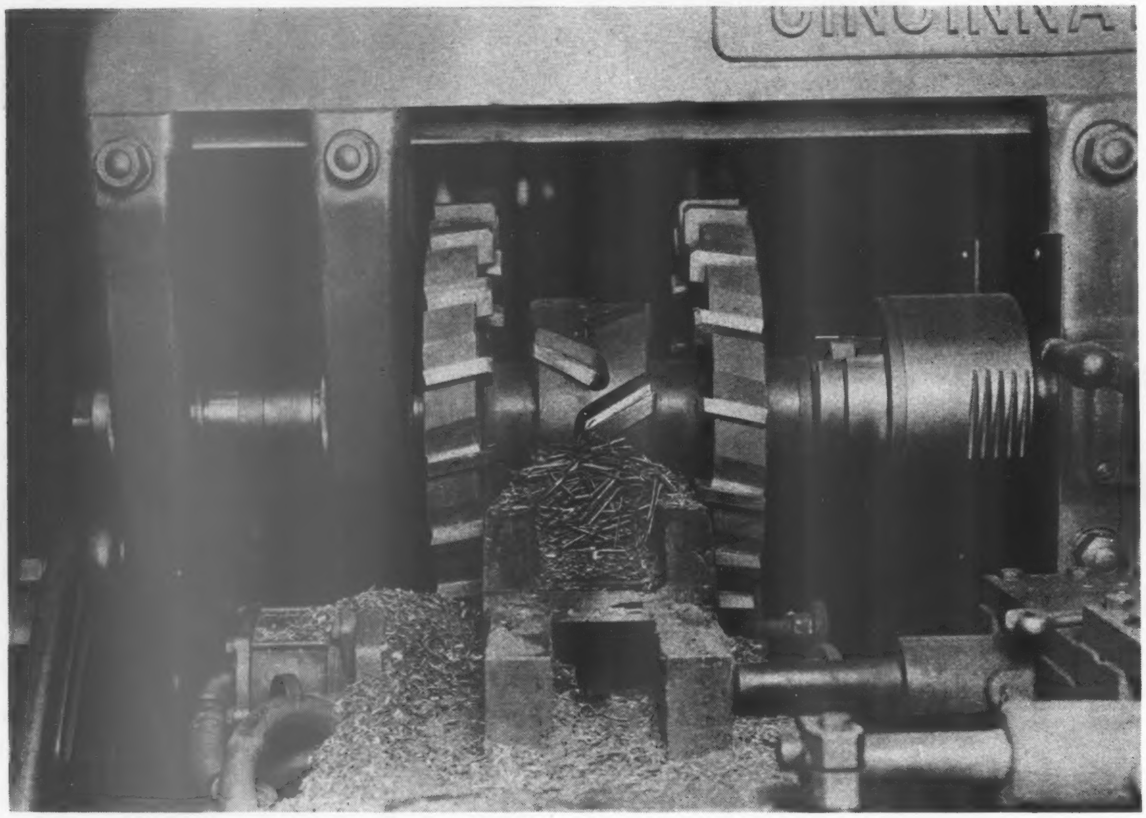
An example of the ability of the modern machine tool to increase production and reduce costs is that of a Cincinnati Hydromatic milling machine, especially equipped with fixtures and cutters for the milling of shoes and wedges and crosshead shoes, in the Lehigh Valley shop at Sayre, Pa.

Prior to the installation of this machine in 1930 for the work mentioned above, the Lehigh Valley machined shoes and wedges and crosshead shoes at several different points on the road. At that time, the road owned 721 steam locomotives and its requirements for these parts for the number of locomotives then in service was somewhat greater than it is now with only 554 locomotives. Under the former conditions the shoe and wedge machining operations in the Sayre shop were performed on three 36-in. by 120-in. planers, each driven by 15-hp. motors and manned by an operator. These planers were installed in the shop in 1905. Because of the high cost of production on these obsolete machines, the Lehigh Valley, in 1930, installed the modern Cincinnati Hydromatic milling machine shown in the illustrations. This machine is equipped with pneumatic fixtures and cutters designed especially for machining the two previously mentioned classes of locomotive parts. This installation has made it possible not only to keep up with the requirements of these parts for the Sayre shop, but also to supply all other points on the road.

Performance of the Machine

The shoes and wedges handled on this miller are of the various sizes required to meet the demand for replacements on the several types of locomotives which go through the shop. The milling operation involves the machining of the driving box fits on shoes and wedges to a finished dimension and the milling of the frame fits to a semi-finished dimension. (The finishing operations for the frame fits are performed on another machine to dimensions furnished by the erecting shop to suit individual locomotive conditions.) By handling the work in this manner on a single machine equipped with fixtures and cutters to do a single type of operation, the job is performed on a production basis. On crosshead shoes all exterior surfaces of the shoes—the crosshead body fit and the outside of the flanges—are finished on the milling machine. The guide fits are finished to dimensions furnished by the erecting shop on another machine.

On the old planers shoes and wedges were produced in gang set-ups at an average rate of three pieces per hour per machine, or at an average time of 20 min. per piece. The total production of the three machines per eight-hour day was a maximum of 72 pieces. The present milling machine is able to produce the same parts in an average time of from 8 to 12 min. per piece, including setting up of the work in the air-operated chucks. The saving in cost on these parts, depending upon the size, varies from 41 to 60 per cent over the same job on the old planers. Production on the new machine is at the rate of from 40 to 60 pieces per 8-hour day, as compared with 72 pieces for three machines when the work was done on the three old planers. In view of the decrease in the demand for these parts due to the reduction



ABOVE—Close-up of the cutter arrangements on the wedge finishing operation

BELOW—Milling machine set up for finishing four surfaces of bronze crosshead shoes at one operation

in the number of locomotives owned and the increase in the mileage between shoppings, the total production on the new machine is entirely adequate.

In the case of crosshead shoes the finishing of the exterior surfaces on the old type planers required 40 min. per piece or a production per eight-hour day of 12 pieces for one planer, or 36 pieces for the three planers. The present milling machine is able to produce crosshead shoes in an average time of from 8 to 10 min. per piece providing an eight-hour day production rate of from 48 to 60 pieces. The saving in cost over the job as performed on the old planer is from 75 to 80 percent. This is entirely adequate to meet all demands for the road. Many sizes of these parts are produced in less time than that given above, but these figures are average production which can be maintained throughout the day.

One set of illustrations shows a set-up of a cast iron wedge on the milling machine. The part shown is being finished to 5 1/32 in. between flanges and 7 1/2 in. over the flanges. The milled surfaces are 30 in. long. Three Goddard and Goddard inserted tooth cutters are being used. Two of these for the outside faces are 16 in. diameter and the third for milling the frame fit between the flanges is 9 in. diameter by 5 1/32 in. over the cutter blades. The cutters operate at a speed of 16 r.p.m. On this particular job production is at the rate of 40 wedges per 8-hour day.

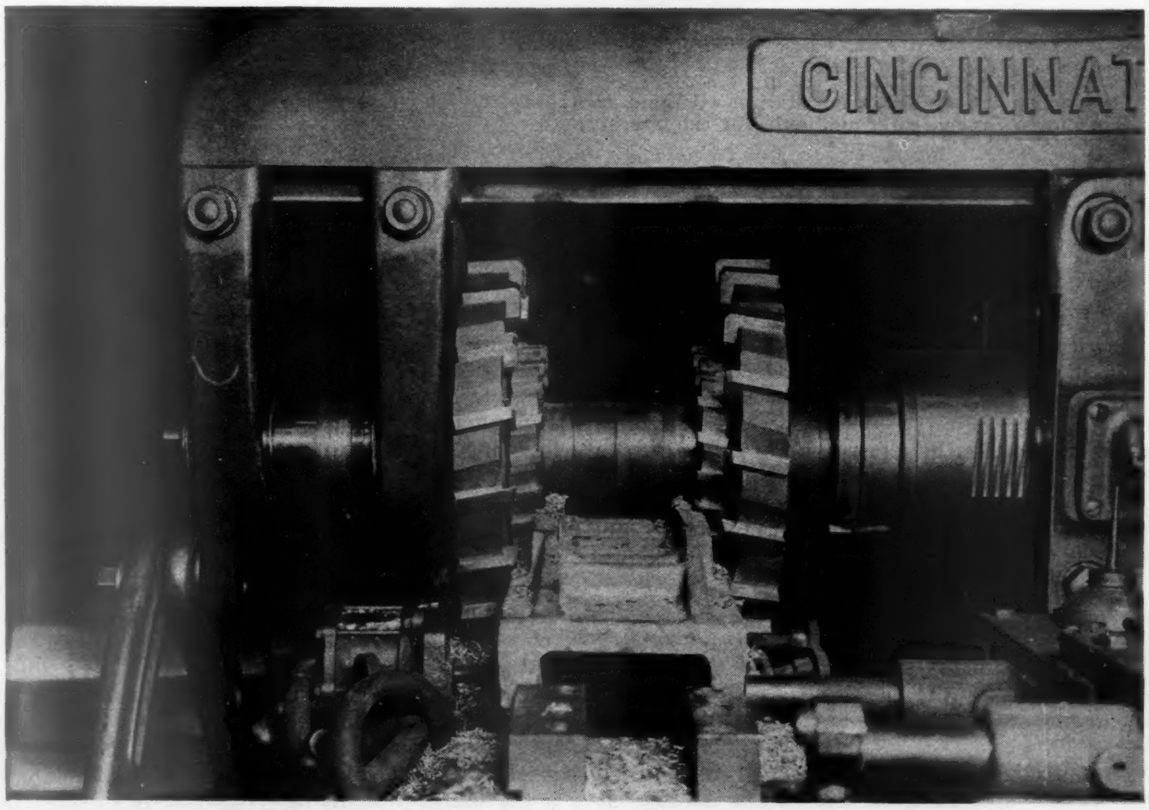
Another set of illustrations shows the machine set-up for bronze crosshead shoes. Two sets of surfaces are milled, the outside of the crosshead shoe flanges and the flanges for the crosshead fit. These bronze shoes are 31 in. long and the finished dimensions over the flanges are 8 1/2 in. and 6 1/2 in. respectively. The Goddard and Goddard cutters used on this particular operation operate at 23 r.p.m. with a 4 1/2-in. feed taking 1/2 in. of material off from the outside faces and 1/4 in. from the flanges for the crosshead fit. Production on the crosshead shoe shown in the machine is at the rate of 40 pieces per 8-hour day.

In connection with the cutters used on this job, it is interesting to note that the average run of cast iron shoes or wedges between grindings of the cutters is 35 pieces and on the bronze crosshead shoes, 12 pieces. Some of the original cutters purchased with this machine are still in service after five years.

Conclusion

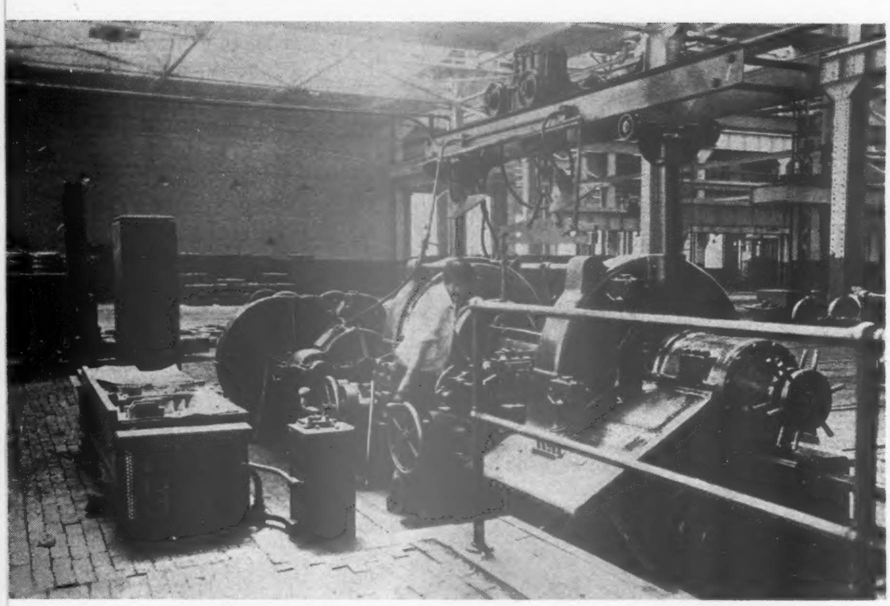
In estimating the potential savings before the installation of this milling machine, the railroad management took into consideration the usual savings incident to the replacement of three obsolete machines with one modern unit with greatly increased productive capacity, as well as savings due to a decrease in the power requirements of the single machine over the three older machines each requiring individual motors, and the savings as a result of decreased machine tool repair costs brought about by the substitution of a modern machine for three others of advanced age. These economies were estimated at the time of the installation to be sufficient to amortize the investment in the new machine under normal conditions in from three to five years. The write-off period, naturally, has been extended somewhat under present part-time conditions.

The four milling cutters remove 1/4 in. and 1/2 in. of metal, respectively, from the narrow and wide flanges of a bronze crosshead shoe 31 in. long



Factors Which Influence Car-Wheel Turning

By David Robinson



A modern wheel lathe installation—Ground tools are shown conveniently available for the operator's use

Car-wheel turning, particularly since the introduction of hardened rims, presents difficult problems from a production standpoint. Several important factors must be co-ordinated to insure success

ONE of the most consistent and continuous operations in a railroad shop is the turning of car wheels. It is a production operation and car-wheel lathes are among the most important machines used in railroad shops.

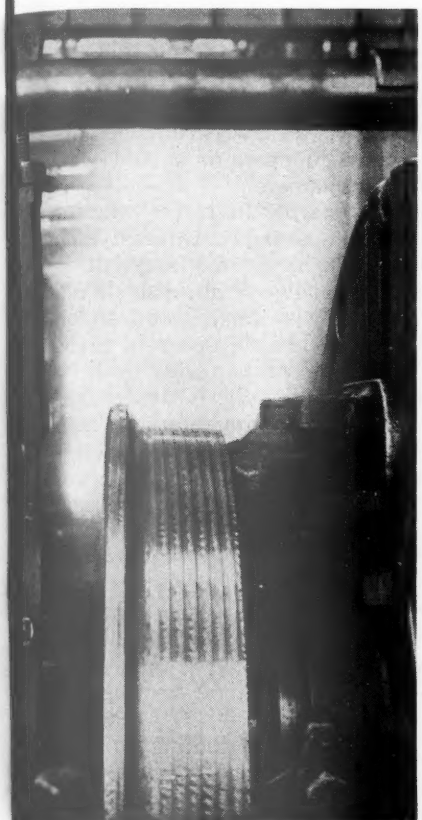
Car-wheel turning, as an operation, is comparatively simple—chucking is not difficult and tooling is not complicated, but due to its very simplicity the operation does not always get the attention that its importance warrants.

Several factors which influence car-wheel turning production are:

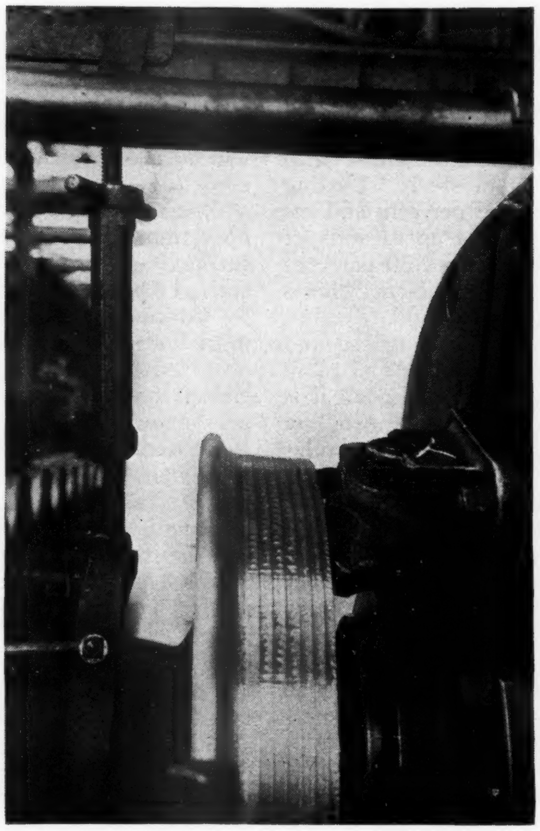
1—Design of the wheel lathe
2—Handling wheels to and from the lathe
3—Quality of the tool steel
4—Quality of the tool grinding
5—Skill of the operator
6—Amount of wear allowed before turning
7—Wheel hardness

The wheel lathe should be so designed that it will adequately absorb and dissipate the terrific strains encountered in wheel turning. The driving dogs should be of efficient design so that slippage does not occur under the heaviest cuts. The drive of the lathe should be highly efficient so that the greatest possible percentage of horsepower may be delivered to the tool, and of the smoothest possible running type so that chatter can be reduced to a minimum, thus eliminating unnecessary time in the finishing operation.

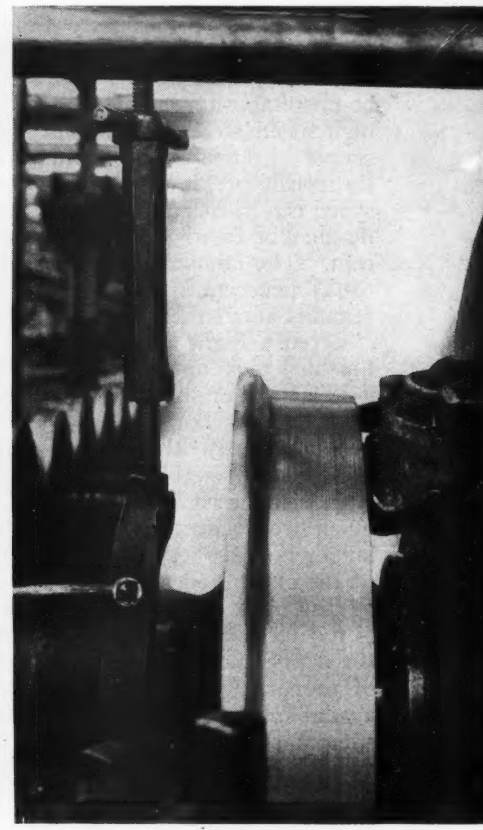
Given a rigid and well-designed lathe, tool steel is the next most important factor. In order fully to utilize the productivity of modern car-wheel lathes, it is necessary to run them fast enough to give 20 to 25 cutting feet per minute at the wheel tread. This cutting speed is altogether out of the question with the grades of tool steel in use in many railroad shops, in spite of the fact that in many cases the lathes now in service are capable of turning wheels at these high speeds. Instance after instance comes to hand of high-powered lathes using only one-half or less of their rated horsepower because low-grade tool steel is used. The basis for judging tool-steel cost is not a matter of cents per pound; it is a matter of wheels turned or metal removed per pound of tool steel used. It is good economy to buy tool steel for a specific pur-



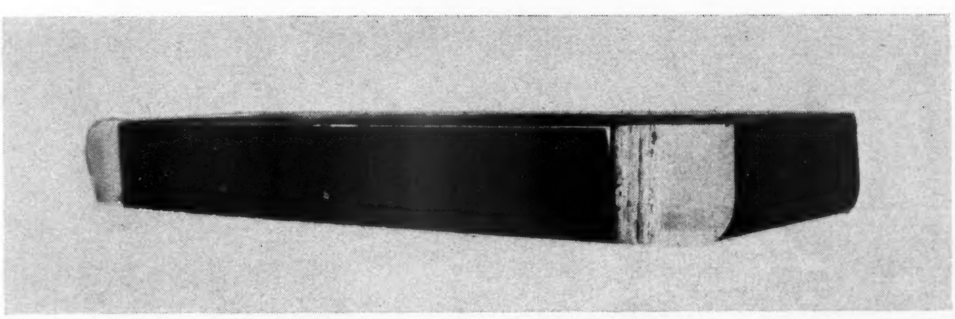
The roughing cut has been completed in 11 revolutions to within 1/32 in. of size—Attention is directed to the flange throat (A. A. R. standard radius) and the flatness of the cut across the tread due to proper tool grinding—These are .81 carbon wheels



Flange semi-finish cut in 3.5 revolutions



Flange and tread finish cut completed in 7.5 revolutions to within one-half tape size



Roughing tool accurately ground by machine

pose. Only the best cobalt steels, properly heat-treated and ground, can be expected to turn car wheels at 20 to 25 ft. per min., or give the maximum output per pound of tool steel used. In the majority of railroad shops the tool steel used permits of no more than 13 to 15 cutting feet per minute. One feature of tool steel requires mention here—secondary hardness. Secondary, red or hot hardness of tool steel is the hardness of the steel at the high temperature created by the cutting action. This *secondary hardness* depends on composition and heat treatment, both of which must be correct to obtain maximum secondary hardness. Cobalt up to certain percentages increases secondary hardness; beyond certain percentages it increases cost but not secondary hardness.

Factors in Cutting Temperature

The temperatures generated in production car-wheel turning are high due to several factors—

a—Toughness and hardness of the wheel tread
b—Depth of cut
c—Amount of feed
d—Cutting speed

These factors in car-wheel turning make it necessary to use a tool steel with high secondary hardness. The lower grades of tool steel or improperly heat-treated tool steel do not possess the necessary secondary hardness to turn car wheels at high speeds with heavy feeds. There is a clearly defined superiority of the cobalt

steels over even properly heat-treated ordinary high-speed steels within the cutting temperature range while improperly heat-treated tool steel is definitely shown to be unsuitable for car-wheel turning. Poorly heat-treated high-speed steel is found all too frequently in railroad shops. Compare the results with those obtained with the cobalt or "low-cost-per-wheel" tool steels. Cutting speed can be increased 30 per cent to 35 per cent and the number of treads turned between grinds up to 400 per cent. The amount of feed can be increased 30 per cent to 35 per cent. The depth of cut on one-cut wheels remains about the same.

Given a high-grade tool steel, both the roughing and finishing tools must be properly ground in the tool room —this is generally done with the finishing tools, but it is just as important to have the roughing tool properly ground because the finishing time bears a direct relation to the roughing cut, and a roughing tool ground with just the right top rake and just enough but not too much front clearance will cut better and stand up for longer periods between grinds. Furthermore, the radius of the cutting edge should very closely approximate that of the A.A.R. standard flange throat—if this radius is too large an excessive amount of work is thrown on the flange and tread finishing tools. An adequate supply of properly ground right- and left-hand tools should be available at the lathe at all times. Under no circumstances should the wheel-lathe operator be required to grind his own tools. Expensive production machines cannot be shut down while the operator takes the time to grind (inefficiently at best) his cutting tools. To require this is to violate all production principles.

A well designed lathe, provided with good tool steel, properly ground, is of little value if the operator is not reasonably skillful. A trained machinist is not necessary to run a wheel lathe—it is an operator's job, but the operator must have proper instruction and incentive, together with the necessary physical and mental ability to operate a wheel lathe efficiently. A few cardinal points will help to indicate just how an operator should proceed to get the most out of his lathe.

One roughing cut is always started first; for efficient operation this order should be maintained through each turning. That is, if the right-hand roughing cut is started first, then the right-hand flange semi-finish should be working before the left-hand is started, and so on until both wheels are finished. If this order is to be observed it is only logical that the proper wheel will be chosen on which to start. If both wheels are in approximately the same condition it is immaterial which is started first; the operator's convenience will determine that. But when wheels on the same axle are not in the same condition (one may have considerable tread or flange wear or it may have slid flats while the mate may be in good condition) it is necessary to start on the wheel requiring most attention and bring the other to a mating condition. If this work is performed in the proper order it contributes to output and makes the operator's job easier. Careless operators frequently get the operations out of order and lose time waiting for one side or the other to catch up.

A second very important point contributing to production is equality of wheel size when roughed—the closer the roughing cuts are to finished size and to each other, the shorter the finishing time will be. Study of careless operators has shown that the greatest waste of time occurs on finishing cuts, because one wheel was roughed so much smaller than the other or an excessive

Wheel transfer truck facilitates movement to outgoing track

amount of metal has to be removed from both wheels by the finishing tools in order to restore the proper tread contour. It is not difficult for a reasonably careful operator to get the roughing cuts within $\frac{1}{32}$ in. or at most $\frac{3}{64}$ in. of each other and of finished size. An operator should never be allowed to be so lax with the roughing cuts that $\frac{1}{8}$ or $\frac{3}{16}$ in. has to be removed by either or both finishing cutters in order properly to size the wheel.

An efficient method of wheel handling to and from the lathe keeps unproductive time low. The incoming track feeds wheels directly to the lathe; finished wheels roll out of the lathe on to the truck and are traversed to the outgoing track. Many other effective methods are in use including the turntable method, pneumatic jack method and various types of crane arrangements. The traversing truck method has some advantages, chiefly the elimination of swinging wheel sets at right angles or making a second crane lift. The important point is to obtain free movement of wheels to and from the lathe. Consideration of this movement must involve the location of the journal lathe; it must not be located so close to the wheel lathe that the free movement of wheels to the wheel lathe will be impeded.

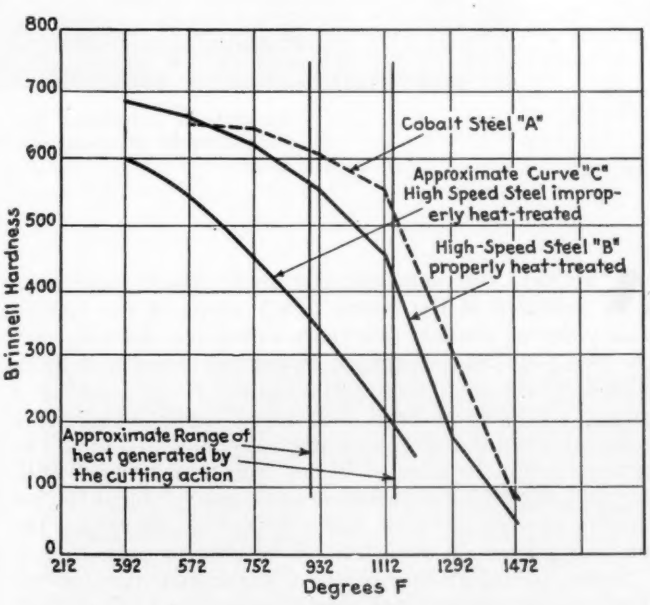
The Measure of Good Performance

The actual turning of a wheel set can be expressed in number of revolutions of the lathe, revolutions becoming time, according to the speed at which the lathe can be run, which in turn is a matter of tool steel. Under very good conditions, it is possible to rough and finish-turn a wheel set in 20 revolutions. At 22 ft. per min. cutting speed, and with a minimum of time for handling, it is therefore possible to get a floor to floor time of 10 min. Of course, this is not practical in regular operation, but it is quite possible with the modern lathes and tool steels available to turn wheel sets in 30 revolutions and with a cutting speed of 20 ft. per min. on a 36-in. wheel, using a reasonable allowance of 5 min. for unproductive time (taping, chucking, setting tools, revolving turrets, movement to and from lathe, and contingencies) a wheel can be finished floor to floor in 20 min. This is good performance and can be maintained for long periods. A good standard performance, however, is one using 34 revolutions for turning at 19 ft. per min. cutting speed on a 36-in. wheel, and allowing 7 min. of unproductive time (an ample allowance), thus giving a floor to floor time of 24 min. This equals 20 pairs in eight hours, and should certainly be looked upon as a standard performance; anything below this standard is inefficient operation and anything above it becomes a plus performance. But, always bear in mind the important fact that these performances are unattainable with poor tool steels.

The performances mentioned are considered to be made on one-cut wheels as the majority of wheels can be brought to size in one cut; however, conditions vary and in some places, there is a considerable quantity of two-cut and even three-cut wheels. It is obvious that some adjustment in production figures must be made if comparisons are to mean anything—it is not reasonable to compare the number of wheels turned in a given time at a point where 10 or 12 per cent of the wheels are two-cut to the production at another point where 40 or 50 per cent are two-cut. It is easy to adjust the work output so that a productive comparison can be made. Careful analysis indicates that the roughing cut requires about 33 per cent of the total time. In order to adjust the production figure, add one-third the number of two-cut wheels in the period under consideration to the total output—for example: 15 pairs turned complete—9 of them were two-cut—add $\frac{1}{3}$ of 9 to 15, making an "adjusted output" of 18 pairs. Comparing the above with a lathe where 18 pairs are turned complete, without the adjusted output, it would appear that one point is 20 per cent more efficient than the other, but if we know that 9 of the 15 pairs were two-cut, and that each of the 18 were one-cut, we readily see that one lathe is doing as much work as the other, even if the wheels available for use are less. This is an important point when production is under discussion.

When wheels are "spotted" for thermal cracks, the time consumed on the spotting cut cannot be charged to production, nor can the time consumed on uusual operations such as shelled treads, etc., be charged to production. The majority of the wheels that come to the wheel lathe are for tread or flange wear, and restoration of the proper tread contour constitutes the production with which we are concerned at this time. Turning out of slid flats can properly be included in the production figures, as modern tool steels can be depended on to stand up, even when encountering the disturbed metal due to slid flats.

Wheel hardness is a factor in production, but the proper tool steels will cut without too much difficulty even the hardest wheels, although some wheels with special tread treatments offer problems even with the best tool steels. A point that deserves consideration by railroad officers is the economic relationship between wheels of extraordinary hardness and the cost of maintaining these wheels—it is impractical to try to turn very hard wheels with a tool steel which is little, if any, harder than the wheel tread to be turned.

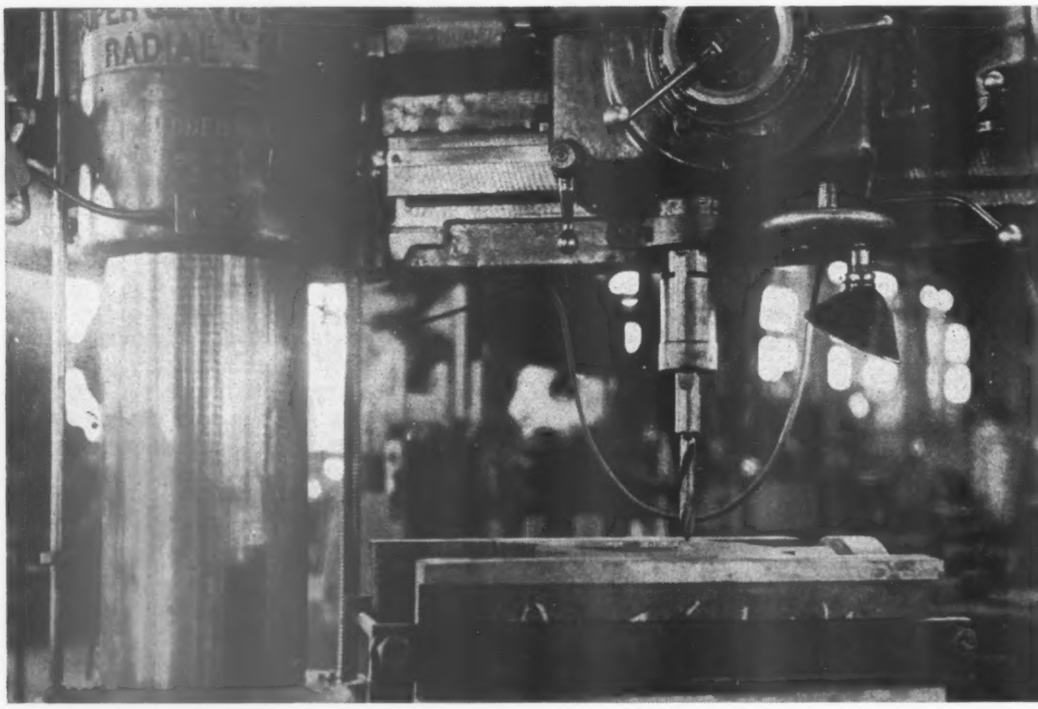


Relation of tool hardness to temperature due to cutting action

Conclusion

Wheel turning is one of the real production jobs in a railroad shop. The facilities for efficiently doing this job exist in the form of modern wheel lathes and tool steels—great savings in costs can be made if these facilities are properly used. Wheel turning is an operation common to all railroads and it is quite likely that the savings that can be shown on this operation will indicate what can be done elsewhere.

Radial Drill Cuts Time on Locomotive Parts



Assembled crosshead and shoes, in clamps, set up on drill table preparatory to drilling holes for bolts

AMONG the new machine tools which have been installed in the Sayre (Pa.) shops of the Lehigh Valley during the last five years to replace obsolete tools are two Cincinnati-Bickford Super-Service radial drills with 6-ft. arms. These machines, which are used for a variety of jobs, replaced 5-ft. radial drills which were installed when the shop was originally built in 1905. The new machines, because of higher power, increased drilling capacity and the inclusion in design of facilities for tapping operations, have made it possible to reduce the machining time on a variety of locomotive parts.

Some of the more important locomotive part operations performed on these machines are: (1) The drilling and reaming of locomotive crossheads for tapered bolts which hold the shoes to the crosshead body; (2) Reaming the crosshead body for the wrist-pin fit; (3) Reaming the crosshead body for the piston-rod fit; (4) Drilling locomotive piston heads and bull rings; (5) Reaming piston heads for the piston-rod fit; (6) Drilling and reaming holes in Walschaert links and link cheeks for the holding bolts, and (7) Drilling and tapping locomotive steam ports. These jobs are typical of the heavier drilling, reaming and tapping operations performed on these modern radial drills.

Drilling and reaming of locomotive crossheads for tapered bolts.—An example of the drilling and reaming operations on a crosshead for a modern freight locomotive is shown in one of the illustrations. On new crossheads the semi-finished crosshead shoes are clamped to the finished crosshead body, and the shoes and crosshead body flanges are drilled and reamed at a single setting for the tapered bolts which hold these parts together. There are eight 1-in. diameter bolts in this crosshead and shoe assembly, for which holes must be drilled and reamed and bolts fitted. On the old drill formerly used for this operation approximately 3½ hr. were required. With the new machine this has been reduced to 1¾ hr.

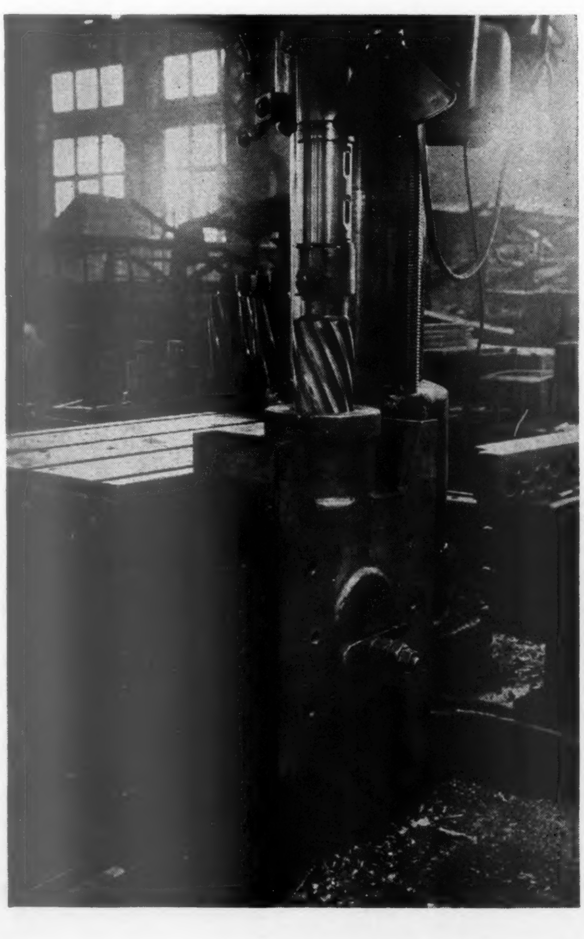
The time given on this job does not by any means indicate the speed with which holes may be drilled through this cast-steel crosshead and bronze shoe assembly. In some cases the drilling time through from 8 to 9 in. of bronze and cast steel is as little as 2 to 3 min. per hole. The 1¾-hr. time given for this complete operation is an example of a new crosshead and shoe and includes the time of setting up and clamping the parts, tooling the machine, the actual drilling and reaming operation on eight holes, the fitting of tapered bolts, and finally, the removal of the work from the machine.

The work on new crossheads is, of course, only a small part of the total work on crossheads and shoes, although within the past two or three years an alteration in design has required the changing of crossheads on a large number of locomotives on this road and the production of completely new crosshead assemblies has run

Reaming the crosshead body for the wrist pin fit

as high as 24 a month. Aside from the new work new shoes are frequently fitted to old crosshead bodies in the course of ordinary repair work. This involves drilling of the crosshead shoes and reaming to match the holes in the old crosshead. Where this is done the old holes in the crosshead body are used as a jig and the flange of the new shoes drilled in this manner. The time required on the old radial drill was approximately $2\frac{3}{4}$ hr. to drill and ream the holes and fit the bolts. This time with the aid of the modern machine has been reduced to $1\frac{1}{2}$ hr.

Reaming the crosshead body for the wrist-pin fit.—Another important job on a locomotive crosshead is that of reaming the crosshead body for the wrist-pin fit. This is shown in one of the illustrations and requires the reaming, in cast steel, of a hole having a maximum diameter in the case of the crosshead illustrated of $6\frac{1}{4}$ in. The old radial drill required 45 min. to do this job; the new time is 30 min.



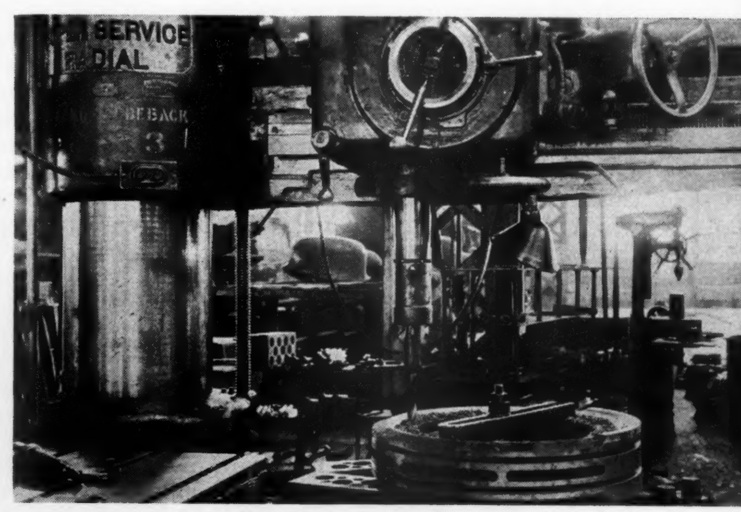
Reaming the crosshead body for the piston-rod fit.—A similar operation to that just described is the reaming of the fit in the crosshead shank for the tapered piston rod fit. This particular case requires the reaming of a $4\frac{3}{4}$-in. maximum diameter hole in cast steel. The former time on this operation of 45 min. has been reduced on the new machine to 30 min.

Drilling locomotive piston heads and bull rings.—Another job which is illustrated is that of drilling a cast-steel piston head and a gun-iron piston bull ring. The job shown on the machine in the illustration required the drilling of twenty $\frac{15}{16}$-in. diameter holes for rivets. On the old machine this operation required 60 min., and on the new machine the time has been cut to 30 min.

Reaming piston heads for the piston-rod fit.—The cast-steel piston head (center) requires a reaming operation for the piston rod fit of a $4\frac{3}{4}$-in. diameter hole (This, of course, varies with the size of the piston and rod). This operation on the old machine required 45 min., and on the new machine the time has been reduced to 30 min.

Drilling and reaming holes in Walschaert links and link cheeks for the holding bolts.—In assembling Walschaert valve-motion links cast-steel link cheeks are secured to forged link centers by means of fitted bolts. A typical example of this job is the drilling and reaming of four 1-in. holes for these bolts. This operation with the old machine required 45 min. The time now required is 30 min.

Drilling and tapping locomotive steam turrets.—A locomotive steam turret of cast brass requires a variety of drilled and tapped holes for attaching the several connections. A typical example of this operation is one requiring the drilling and tapping of several holes ranging in diameter from $\frac{7}{8}$ in. to $2\frac{1}{2}$ in., which, on the old type radial drill, required 75 min. to perform. The new machine does the same job in 30 min. The comparatively long time required on the old machine was due to the fact that the old model radial drill did not embody facilities for backing out taps.



ABOVE—Drilling the holes in a piston center and bull ring for the rivets

LEFT—A solid type crosshead being reamed for the piston rod fit

FIG. 1—Four Stephenson gear eccentric straps ready for finishing

FIVE Time-Saving Grinder Jobs

THE development of surface grinders and fixtures has made it possible to perform many locomotive machining operations with substantial reductions in the time required. A few typical examples of some of this kind of work are shown in the illustrations accompanying this article. Five jobs which were formerly done on other types of machines are now performed on a modern Bridgeport heavy-duty face grinder in a large eastern railroad shop, with savings in time varying from 37 to 52 per cent over former methods.

Eccentric Straps—Fig. 1 shows the set-up for cast steel eccentric straps on the face grinder for removing ¼ in. of stock from four straps at one setting. This is a job that was formerly done on a planer requiring an average time of 16 min. per piece. On the present machine the average time per piece is 10 min., 3 min. of which is handling time and the remaining 7 min. grinding time. A time saving of 37 per cent is shown on this operation.

Tender Tank Wells—In finishing the type of tank well, or tank valve chamber, shown in Fig. 2, it is necessary to remove .010 in. of cast iron from a surface required as a flat valve seat. Formerly this job was done on a boring mill and required an average of 42 min. per piece for machining. By utilizing the face grinder in the method shown in the illustration, it is now possible to finish these parts in an average time of 20 min., indicating a saving on the production time basis of 52 per cent.

Exhaust Pipe Bases—Fig. 3 shows the fixtures for finishing the bases of locomotive exhaust pipes. The finishing operation requires the removal of .020 in. of cast iron. These exhaust pipe bases were formerly finished on a boring mill and required 82 min. per piece for the entire operation floor to floor. By utilizing the face grinder this time has been reduced to 51 min.—a saving of 37 per cent. This may seem a rather slow operation, but it is a job on which great care must be taken in order to produce surfaces that will be steam tight. The two ends of these exhaust pipes are ground as a part of this finishing operation and the two surfaces must be exactly parallel, which presents a difficult problem on a casting of this size because of the amount of checking that must be done as the job proceeds. A feature of this job is the fixture used. This is built so that the casting may be rotated 180 deg. without being unclamped. Exhaust bases of this type run from 20 to 30 in. high. The ground surfaces vary from 7½ in. diameter to 10 in. diameter in some cases, and in other cases have oblong surfaces 9 in. by 14 in.

Locomotive Guides—This operation presents an example of the greater productive capacity of a modern grinder over a grinder several years old. Fig. 4 shows the set-up of a locomotive guide having a surface requiring extremely accurate finishing, 6 in. wide by 62 in. long. The finishing of these guides was formerly done on an old modern guide bar grinder and required 43 min. floor to floor for the entire operation. The present machine is able to do this work on this size guide in 22 min., a saving of 49 per cent in time.

Link Trunnions—Fig. 5 shows an operation requiring the removal of ⅛ in. of stock from the end pads of a Walschaert gear link trunnion, 5 in. wide by 29 in. long. This is a job that formerly required 31 min. floor to floor on a crank planer. It is now performed with the aid of the fixtures shown on the modern face grinder in 17 min.—a saving of 45 per cent over the former method.

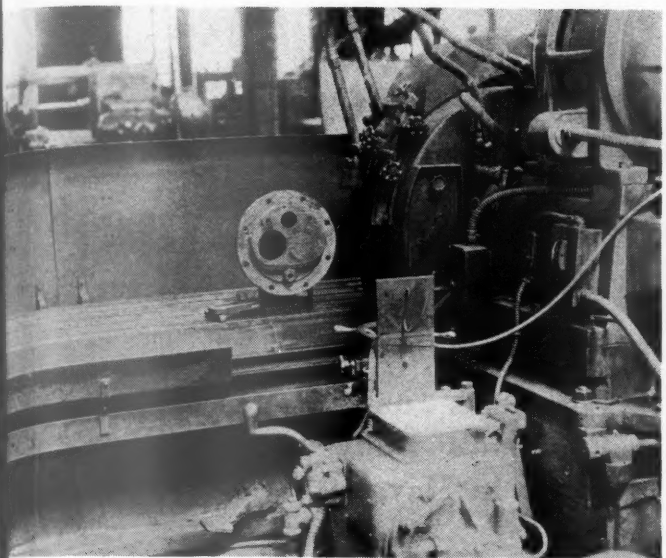


FIG. 2—Tender tank well preparatory to finishing flat valve seat

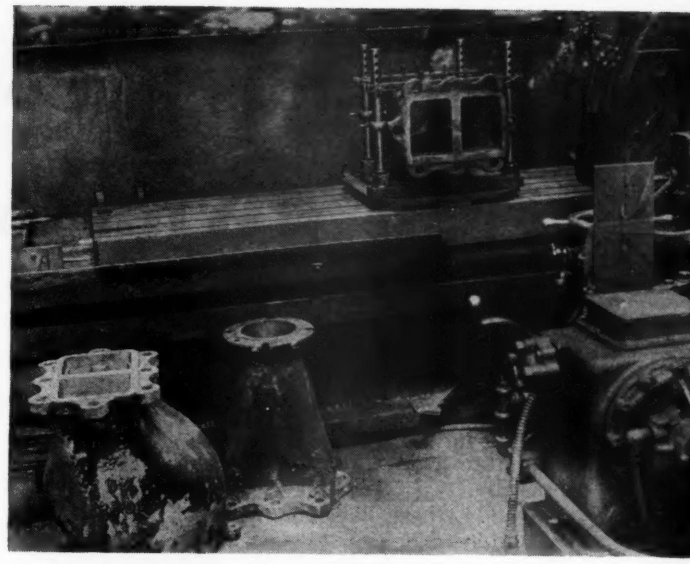


FIG. 3—Double exhaust pipe base set up in special fixture for finishing steam tight joints on top and bottom

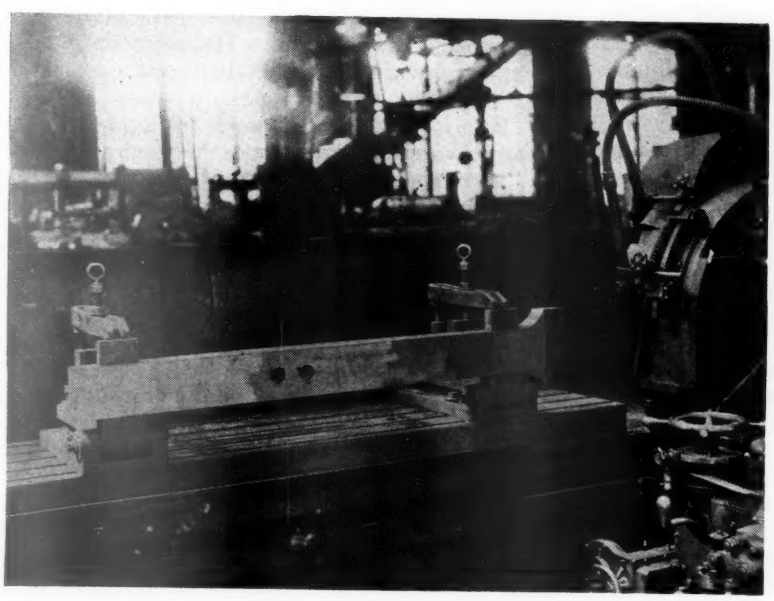


FIG. 4—A locomotive guide 6 in. wide by 62 in. long which is finished in 22 min. floor to floor

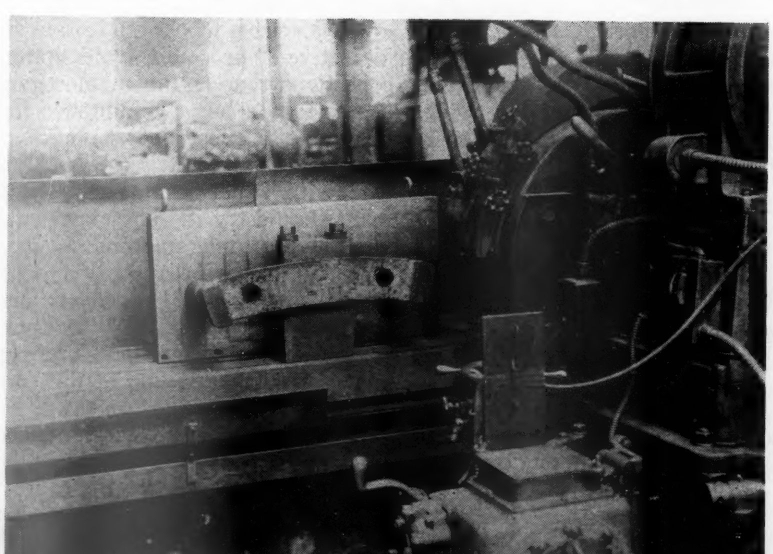


FIG. 5—Arrangement of fixtures for grinding Walschaert link trunnion

High Spots in Correspondence With Enginehouse Foremen

Comments on "Roundhouse Foreman's Daily Log", published in May, 1935, issue

"TO read 'Roundhouse Foreman's Daily Log' is to look upon a familiar scene, as I happen to run a roundhouse night shift and can corroborate all his statements and have some of my own left over. One could write indefinitely on the situations the roundhouse foreman has to meet and get the better of in order to stay on his job.

"Usually, these days, hampered by a too small staff, the routine of getting engines in the house, work done, and out on the road again, taxes his resources heavily enough, but when things don't go right, when he gets "one of those nights"—or days—then he has to step out and show what he can do. The things that can happen to a locomotive are almost unbelievable, and are absolutely unbelievable to the general office staff—but they do happen and the roundhouse foremen are the genii who work the almost miracles which are at times necessary to keep things moving; in fact, I know of no job which calls for more general knowledge, versatility, and the ability of quick decision than that of the roundhouse foreman at a busy point. The salary is fairly good and we earn it. The hours are long and strenuous; we work, eat and sleep, and the extent of our social life and amusement is meeting the engine crews as they come in and go out.

* * * * *

"All enginehouse foremen should have three straight eight-hour shifts in the enginehouse, same as the men. The foremen should have one day off each week.

"I work from 7:00 p. m. to 7:00 a. m. I have no assistance. Due to the volume of business that moves during these hours there is 12 hours of active supervision necessary. This amount of supervision becomes a problem of physical endurance. We can maintain a lively pace for eight hours, but adding the other four hours taxes us to the very limit. A full 12-hours of active supervision is required. The locomotives must be perfectly conditioned to function properly on the high-speed schedules that our passenger and freight power operate on. Each job must be assembled so as to avoid delay en route and this means that all new work must be closely supervised.

Each Year Brings More Strenuous Conditions

"Each year brings a faster schedule and consequently closer supervision is required. Each year our work becomes more strenuous. Doesn't it appear, from an investment standpoint, that it is an economic necessity to work the enginehouse foremen three straight eight-hour shifts along with the men? The erecting, machine shop, blacksmith shop, pipe shop foremen, etc., all work eight hours.

"I am unable to participate in a well-rounded and balanced life. The inspiration that a person gets from pleasant companions, good books and a reasonable amount of recreation is denied the enginehouse foreman. He is unable to take his place as a husband and father and share in the home life."

* * * * *

"The facts contained in The Roundhouse Foreman's Daily Log are all true, every word.

"All long runs now, engines get serviced every 300 to 500 miles instead of 100 miles, still running repairs are supposed to be made as quickly and cheaply as before.

"Classified repairs are now all handled in the roundhouse with the exception of Class 1 and 2 work. All this extra work must be done on roundhouse machine tools that were sent over from back shops when they were considered worn out. Heavy modern power is to be repaired with equipment that was obsolete for back shop repairs to heavy engines.

"There is all this extra work to do and a 20 per cent cut and two relief days a month taken away."

* * * * *

"There is no one who fully understands the conditions the roundhouse foremen work under excepting themselves, and unfortunately there are very few of them, including myself, who can construct a word picture describing those conditions clearly enough to convince others, or create a desire on the part of others to help smooth out the difficulties.

"The writer of the 'Log' did not exaggerate. I am sure he left out much of the details of his night's experience, trying to list as briefly as possible the high spots. The smaller things usually constitute the force which gradually wears a foreman down, because of their number; they require that he go here or there, and oftentimes he knows he should be several places at the same time.

Nerve-Racking Job

"One thing which stands out in the 'Log' is the statement that often engines are offered for service that the foreman knows are not perfect. May I add to that and say I do not know a foreman who would offer an engine he knew to be defective if he could avoid doing so, but under present conditions there is no man, regardless of ability, who can step into a busy roundhouse today and get proper repairs made to every defect on every engine every day.

"Some of those with superior authority in the mechanical department should try it. The experience would be beyond price, with the understanding, however, that they could not use their superior authority to call in an additional man or so, or work a little overtime, or use the regular foreman for an assistant. In other words, under the same conditions as the regular foreman works, my prediction is a nerve wrecked flop at the end of any two weeks, even though he would not write himself letters about a few hundred things he had done or failed to do during that time."

Modern Materials for High Pressure Boilers†

By L. P. McAllister*

IMAGINE admitting 10 to 15 years ago that boiler plate with a tensile strength of 75,000 lb. per sq. in. was fit for fabrication. Common opinion would have readily labeled such steel as hard, and yet today agreement is almost unanimous that 55,000 lb. minimum tensile strength steel, equal to specification S-1 of the American Society of Mechanical Engineers Boiler Code, is losing its popularity, particularly in heavy walled shells.

Designers have turned from butt-strapped joints to fusion welded seams, and with welding came restrictions on material which the process of riveting did not demand. Fabricators realized and welding experimenters discovered that in large sections or heavy plates some lack of uniformity in chemical composition presented problems in obtaining ductile welds. Therefore, at the introduction of the metallic arc, the steel manufacturers found themselves confronted with a demand for more uniform steel to permit acceptable welded joints.

With the demand for a more uniform base metal came extensive experimentation and development in welding technique and procedure. Next the carbon content in the boiler and firebox grades of steel was limited to 0.35 per cent maximum. This restriction, although seemingly a natural one from the fabricating group, made it practically necessary that heavy plates be no longer produced of open or rimming steel, and required a killed or deoxidized steel by which process the carbon content could be maintained more uniformly from end to end of large plates, thereby offering to the welder for his seams more homogeneous and uniform edges.

Demands for higher pressures brought the necessity of thicker shells, and to meet or overcome some restrictions of fabrication the Boiler Code adopted two new higher tensile steels, namely, Specification S-26 and Specification S-27, respectively calling for 70,000 lb. per sq. in. minimum tensile strength for plate material up to and including 2 in. and over 2 in. up to and including 4 in. Here was a decided forward step, recognizing the advisability of higher strength material balanced by good ductility and workability. Many tons of plates have been rolled, and to match these numerous heads have been flanged of this so-called high tensile grade. Success to date has been rewarded by an increasing demand for this 70,000 lb. per sq. in. minimum material.

Alloy Steels

The next step in developing plate material presents a new angle; the welding technicians advise against higher carbon, so to meet the still pressing requests for high strength, alloying elements have to be added to the plain carbon analyses. The properties of plain carbon steel, through long usage, have become fairly well known as have also its economic limitations. Now, with the advent of additional and sometimes singular properties resultant from contained alloy, boiler and pressure-vessel plate and head material presents a new economic aspect for consideration. When planning alloys for plate material, the first incentive is to produce higher strength without unproportional loss of ductility. High strength in sufficient increments naturally permits a decided decrease in wall thickness and weight, and thereby presents for comparison a saving in purchased weight. The use of alloy steel may perhaps be more economically justified when due consideration is given to such factors as decreased purchased weight, reduced transportation costs on this lighter weight material both in the unfabricated and the fabricated state, possible lower shop costs due to the welding of thinner shell sections, and the metallurgical advantages derived from contained elements. Prevailing fabricating methods and welding technique must be given due regard in new steels. Little, if any, advantage would result from superior quality alloys if fabrication and welding could not be carried out with success.

Higher Safety Factors?

All designs today of Code construction, either American Society of Mechanical Engineers or American Petroleum Institute, are based on a safety factor of 5 or 4 and working stresses of ordinary steel are used as engineering data. Much work is to be done to prove that higher strength, properly balanced alloy steels can present to the designer permissible stresses above those now set down for plain steel. A joint committee is at work and shortly it is believed that new and higher allowable working stress tables will be adopted, thereby permitting advantage to be taken of the higher physical properties. To be fair and safe, much technical data must be collected and summarized in order that designing engineers, operators and inspecting groups may have confidence in the values.

From judicially mixed or single alloys one should expect some or combinations of several of the following properties above those obtained in ordinary plate stock.

(a) High strength at elevated temperatures.
(b) High impact resistance at upper working temperatures.
(c) Definitely improved creep values.
(d) Good sub-zero impact ratings.
(e) Added resistance to some corrosive media.
(f) Better fatigue results.

To what elements now can the steel metallurgist turn for the providing of some of these improvements in large plate form?

Automotive engineers have had at their command for many years many alloy combinations and tube buyers likewise have had a fairly broad field from which to select. The production and fabrication of small parts, however, does not present the hazard that mass does. Vessel and boiler material must come from alloy analyses

† Paper presented before the annual meeting of the National Boiler & Pressure Vessels Inspectors, Chicago, Ill., May 16, 1935.
* Assistant metallurgical engineer, Lukens Steel Company, Coatesville, Pa.

which can be readily produced and constructed; thermal effect on large and heavy sections has to be dealt with. Fortunately, shell and head materials are available today in alloy steels which are not so sensitive to the various stages of making and shaping, and thus the fear of hazardous workability has been minimized. Note should be made here that for welded construction the Codes have listed among acceptable specifications only plain carbon steel for shell fabrication. However significant this fact may be, the day is not far distant when several alloy combinations must become essential parts of material specifications. High strengths are not at their maximum and as the welding art has changed its acceptable standard, so will limits of pressure, temperature and base material. The next great step will undoubtedly be to base material having a minimum of 100,000 lb. per sq. in. tensile strength. The demands are present, the methods of production and fabrication are progressing and developing by experimentation, and slowly but safely is being gathered the knowledge needed for achieving this goal.

As stated previously, alloying elements for plate construction must not, for sensible fabrication, exhibit pronounced air hardening characteristics. The application of intricate or even simple heat treatments are not always advisable; quenching and tempering and long time furnace annealing are always accompanied by out-of-flatness and warpage, making plate fabrication difficult if not impossible. So, in existing developments steels are being offered which have the improved qualities in the "as rolled" condition. Keeping this problem foremost, the full benefit of all the non-ferrous elements cannot be had. Equipment to some extent limits the production of the more special alloys requiring special treatments but with the hoped for industrial expansion it is to be expected that progress will not be retarded.

The common alloying elements of nickel, chromium, silicon, molybdenum and vanadium have been used with remarkable success. By use of small percentages steel makers have been able to produce some of the qualities which should be expected from a higher-base-price material. One of the chief outstanding metallurgical advantages of the use of the elements mentioned is the maintaining of high strength by substituting one or more of these elements for increased percentages of carbon. Thus, with the so-called low alloy content steel, carbons need not exceed or even reach the limit of maximum 0.25 per cent, as used in a 55,000 lb. per sq. in. tensile strength steel, to produce tensile values over 50 per cent higher than this figure.

Unfortunately there has existed in the minds of some users a suspicion or feeling of mystery about alloys. The metallurgical benefits from contained elements need only some understanding to alleviate such suspicion. Some regard for the properties imparted may slightly change fabricating methods, but not to such a degree that any ordinarily well equipped Class 1 welder need fear his ability to construct. Nickel, chromium, silicon, etc., are used to improve the steel, not to make it more mysterious. Stiffness of alloyed material is to be expected, but so long as brittleness does not accompany the higher strength, the resulting toughness is an advantage. All tonnage to date has been preceded by experimental work and it would not be amiss to discuss a few of the rather recently used alloy materials which have proved themselves worthy of the confidence intrusted to them.

Nickel and Molybdenum Steels

Two per cent nickel steel with carbon under 0.20 per cent, pioneered by a Canadian railway in a large locomotive construction program, has served so well that many United States roads have installed wrapper sheets of this analysis. The tensile strength of 75,000 lb. per sq. in. permitted a decrease in shell section, and although subject to the stress of locomotive service, the excellent ductility (see Table I) of this type has proved its merit. Even inside firebox sheets with an ultimate of 65,000 lb. per sq. in. have been installed, and longer life of side sheets with minimized crowfeet checking.

Table I—Chemical and Physical Properties of 2.0 Per Cent Nickel Steel Plates

Analysis				Thickness	Yield point	Tensile strength	Elongation per cent
C.	Mn.	Si.	Ni.	in.	lb./sq.in.	lb./sq.in.	in 8 in.
.13	.52	.20	2.10	½	52,500	76,000	28.00
.16	.56	.21	2.25	¾	44,000	75,000	28.50
.16	.57	.25	2.08	⅞	47,000	75,600	26,00
.17	.66	.23	2.23	1	49,300	82,000	26.25
.16	.56	.21	2.25	1	46,600	75,500	29.00
.18	.68	.19	2.90	2	47,800	79,000	23.70

Due attention is just beginning to center around carbon-molybdenum plate steel. By this is meant carbon under 0.25 per cent and molybdenum between 0.40 and 0.60 per cent. Tubes of this grade have been successfully used and the plate industry is now arousing to the advantage that molybdenum gives, i. e., definitely improved physical properties at elevated temperatures. One has only to scan the creep values of carbon-molybdenum steel and compare them with values on steels of equivalent room temperature strength, and the imparted improvements can be noted readily. Advantage has been taken of this element in Europe for years. In plate and vessel material, room temperature strength of 75,000 lb. per sq. in. can be easily obtained.

Cromansil Steel

Mention was made previously that the American Society of Mechanical Engineers Boiler Code had not adopted any alloy grade for welded construction, and this is true. But one alloy specification, namely S-28, has been approved for riveted construction. Such rapid and satisfactory progress has been made with this "C.M.S." steel that obviously early recognition for welded vessels is looked for. This "C.M.S." specification, as listed in trade name, represents an alloy called Cromansil. Such steel is made and listed in two grades, i.e., minimum 75,000 lb. per sq. in. and minimum 85,000 lb. per sq. in tensile strength The carbon content in the first grade is limited to 0.17 per cent maximum, while the 85,000 lb. per sq. in. minimum class permits a 0.25 per cent maximum carbon. The name of this popular low alloy—Cromansil—reveals its chief components, i.e., chromium, manganese and silicon. Each of these elements is found in the following ranges: chromium 0.30 to 0.60 per cent, manganese 1.05 to 1.40 per cent, and silicon 0.60 to 0.90 per cent. The metallurgical balance of these three toughening elements has made possible a very versatile and workable low alloy steel of good high strength properties without the decided loss of that very necessary factor called ductility. (See Table II.)

The merits of any material are best substantiated by its use, and actual tests are worth many expert opinions. The many tons of this steel which have been most successfully welded into Diesel engine frames and housings of various intricate shapes and thicknesses, and the complete power units developing around 600 hp. at 1200 r.p.m. with the accompanying vibratory stresses prove beyond a doubt that this alloy has weldability and toughness which warrant much added consideration. Taking advantage alone of the high strength of the 85,000 lb.

(*Continued on page 391*)

Northern Pacific Locomotive 2626 Overhauled

Bearings of former Timken Locomotive 1111* found in excellent condition after 280,000 miles

THE Northern Pacific purchased on February 6, 1933, Timken Locomotive 1111 and placed it in regular fast passenger service. Up to October, 1934, locomotive No. 2626, as it is now designated, had developed a total of over 280,000 miles when it was necessary to send it to South Tacoma shops for general repairs to the boiler and machinery.

Prior to this time the locomotive had not received general repairs since it had been built. This was a good opportunity to check the roller bearings to determine their physical condition. To do this all bearings were removed from the engine truck, driving wheels and trailer.

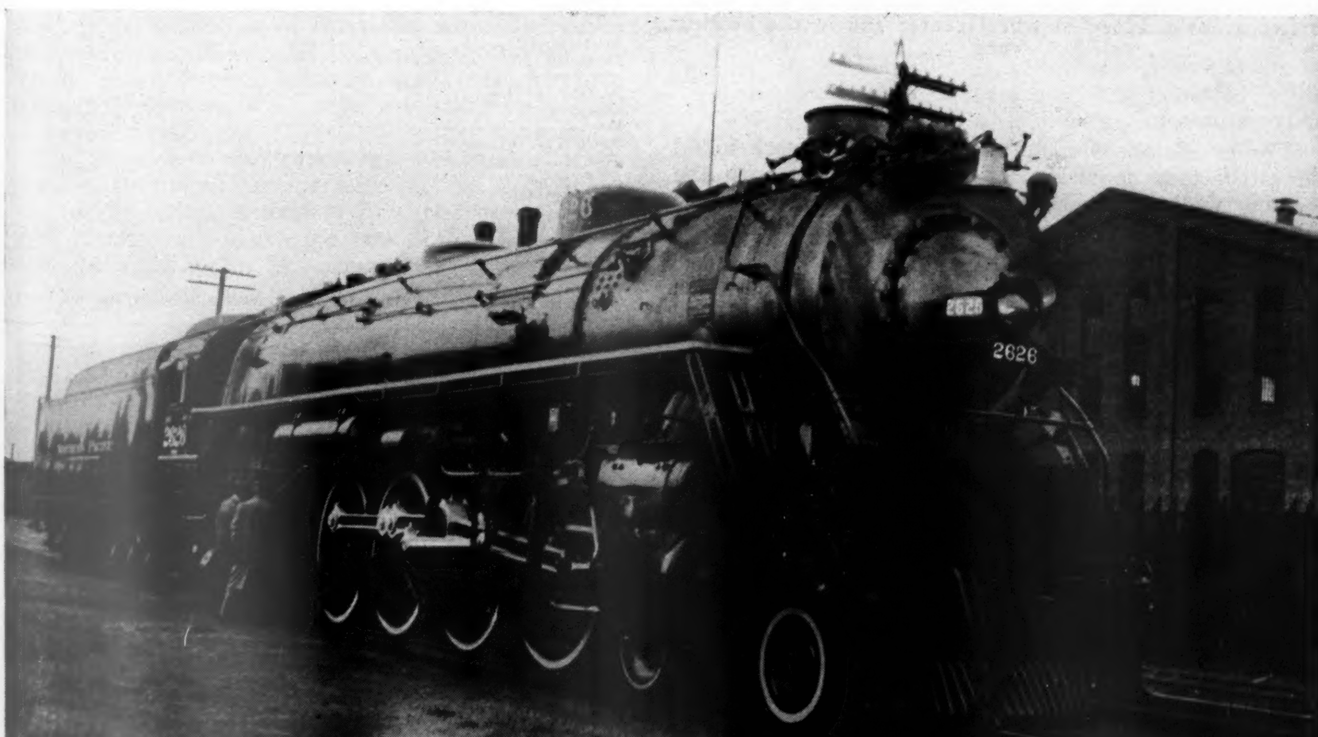
On examination all Timken roller-bearing assemblies were found to be in excellent condition and were returned to service, with the exception of the main driver bearing cones, which had to be renewed on account of replacing the 11½-in. main driving axle with a 12-in. axle. However, the old cups and the old rollers which had carried the load for 280,000 miles were re-applied for further service.

The main driver axle was redesigned in accordance with the latest practice as developed by the photoelastic studies on railroad axles and wheels conducted by The Timken Roller Bearing Company at the University of Michigan. The changes made are illustrated on the accompanying drawings, one of which shows how a raised seat was provided for the bearing cone and how stress relief grooves were provided in the wheel hub and in the bearing cone. The other shows the new main axle detail and illustrates the taper which was provided both ways from the center to give a uniform stress gradient throughout the entire length of the axle.

* Described in the June, 1930, and March, 1932, issues of the *Railway Mechanical Engineer*.

Details Developed by Roller-Bearing Inspection

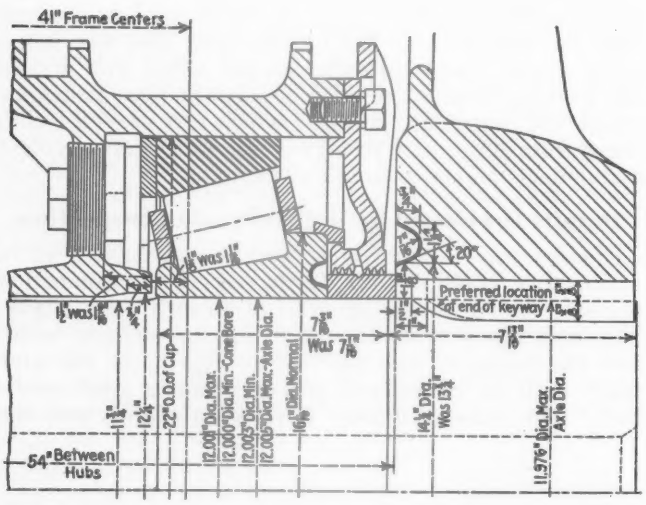
Engine truck.—The cones, rollers and cups were in satisfactory condition for further service, examination showing only a few thousandths of an inch wear, if any. The housings showed from 0 to $\frac{5}{64}$ in. wear in width and the trunnion boss $\frac{1}{32}$ in. to $\frac{5}{32}$ in. in diameter wear. All enclosures and spacers were in good condition. The trunnion guides were worn slightly and the



Northern Pacific locomotive equipped with Timken roller bearings which ran 280,000 miles before being shopped for general repairs

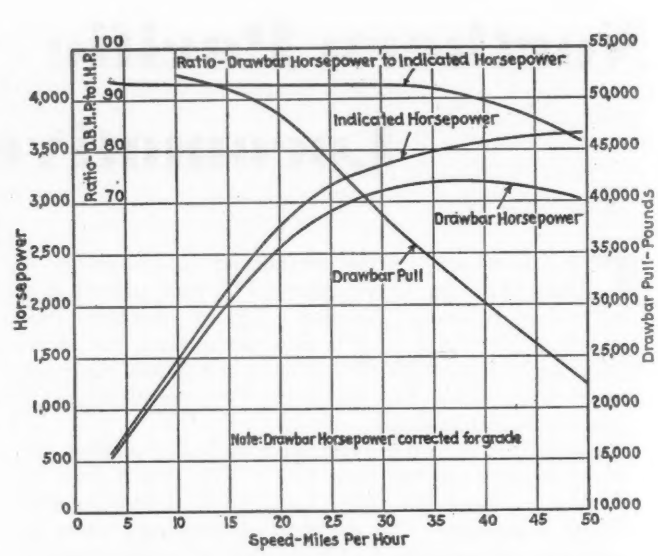
pedestal opening increase 1/32 in. to 1/16 in. Necessary corrections in wear-plate thickness were made.

Driving Wheels.—The cones, rollers and cups were found in good condition, with the bearing wear hardly measurable. All housings were satisfactory except for a slight increase in cup seat diameter due to the lateral motion rollers being worn into the front housing 1/16 in. to 5/32 in. Some enclosure bolts were broken and worn bolt holes in the left main were built up and redrilled. All spacers were satisfactory, but the left main was renewed with oversize spacers to reduce the enclosure clearances. Trunnion guides and pedestal liners on both main jaws were galled and had to be renewed. All other guides and liners were in excellent condition, with no wear indicated on the boxes and flanges.



Details of main-axle wheel fit and roller bearing on locomotive 2626—heavy lines indicate location of new stress relief grooves added in wheel center and in the bearing cone

Trailer Axles.—Cones, rollers and cups were found in satisfactory condition for further service, with the bearing wear slight, if any. The trailer housings were in good condition, with wear in width not exceeding 5/64 in. Trailer enclosures were satisfactory, except for the left front which was .042 in. large in the vertical bore. One liner on the right front jaw was cracked at the flange, and the pedestal openings showed 1/16 in. wear.

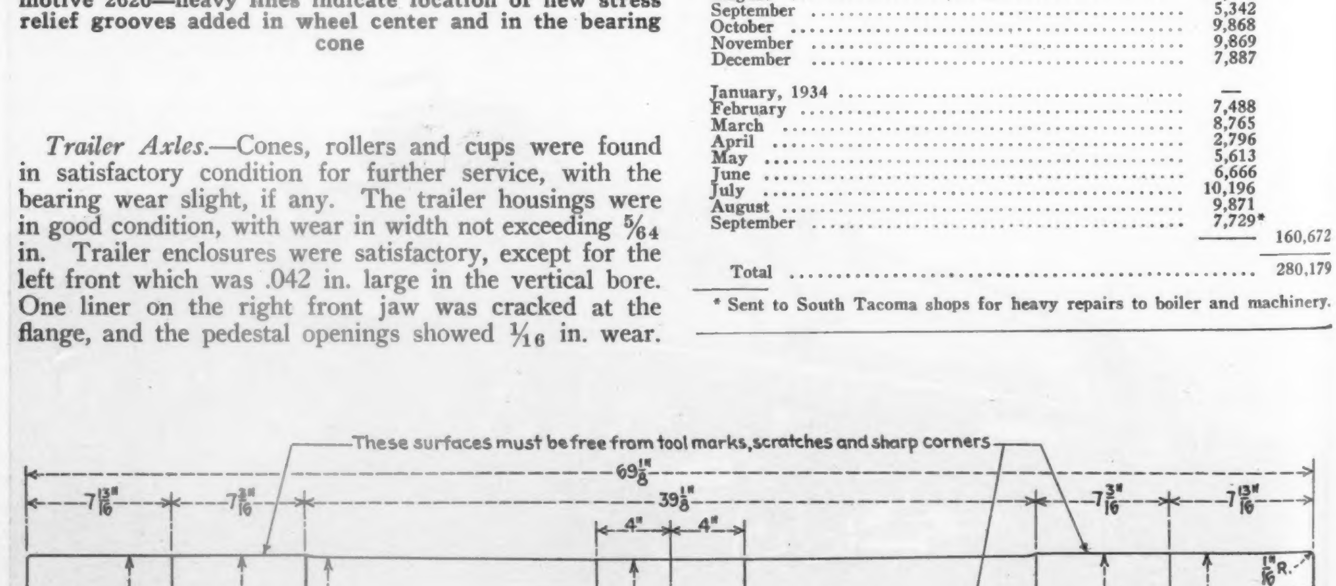


Curves showing variation in drawbar pull and horsepower during dynamometer car tests of locomotive 2626 in freight service between Pasco and Lamont, Wash.

Record of Northern Pacific Locomotive 2626 — Timken 1111

Mileage in test service on 12 other roads		89,992
Locomotive received on Northern Pacific line, October 27, 1931		
Right main crank pin failed due to overheating, March 12, 1932		
Mileage from October 27, 1931, to March 12, 1932		30,515
Locomotive purchased by the Northern Pacific February 6, 1933		
Shopped for repairs to boiler in April and May, 1933		
Given Class 5 repairs, including tire turning, January, 1934		
Mileage from March 12, 1932 to general shopping, October, 1934:		
August, 1932	4,684	
September	5,819	
October	7,337	
November	3,459	
December	3,289	
January, 1933	6,134	
February	7,699	
March	2,678	
April	—	
May	—	
June	7,913	
July	9,374	
August	10,198	
September	5,342	
October	9,868	
November	9,869	
December	7,887	
January, 1934	—	
February	7,488	
March	8,765	
April	2,796	
May	5,613	
June	6,666	
July	10,196	
August	9,871	
September	7,729*	160,672
Total		280,179

* Sent to South Tacoma shops for heavy repairs to boiler and machinery.



Details of the 12-in. main axle which was applied in place of an 11½-in. axle—Note uniform taper from center and 4-in. radii at junctions with journal bearings

This condition was corrected by the application of new wear plates. All rollers on the front trailer lateral motion device were in satisfactory condition.

Tender Axles.—All bearings were in good condition. All housings were worn slightly on the pedestal faces, being built up by autogenous welding.

The foregoing indicates in some detail the wear which developed in these roller bearings after 280,000 miles of service. A certain amount of microscopic wear on the cones, rollers and cups, sometimes called "water etching" and thought to be due to the action of water which gradually accumulates in the oil reservoirs, was observed. Provision has been made for the application of drain plugs and periodic replacement of oil to prevent this condition. It is anticipated that the Timken roller bearings on this locomotive may have a further service life sufficient to make the total exceed 1,000,000 miles.

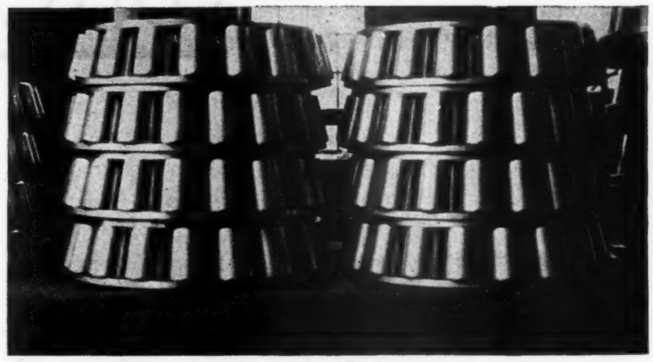
Service and Test Performance

Beginning in August, 1932, Locomotive 2626 was used in passenger service on Trains 1 and 2 between Seattle, Wash., and Yakima, doubing the division each day for a round-trip distance of 326 miles. The locomotive is now used on Trains 1 and 2 between Seattle and Missoula, Mont., a distance of 656 miles. This route comprises five former engine districts and is featured by a limited amount of 2.2-per cent grade, on which the locomotive can handle nine cars. Inasmuch as 16 cars must be hauled on some days, a Mikado helper is provided over the Cascade Range between Lester, Wash., and Easton, and over the Coriacan Defile between Dixon, Mont., and Missoula.

In test passenger service, the locomotive has averaged 17.85 lb. of coal per passenger car-mile and shown an average evaporation of 4.81 lb. with Roslyn coal, a western bituminous coal having an average heat value of 11,300 B.t.u. On one long run of 906 miles from Missoula to Jamestown, N. D., the locomotive made the run in 25 min. less than the schedule time for the district. On another run of 346 miles from Jamestown to St. Paul, hauling 10 cars, 57 min. was made up, the average speed for the entire distance being 50 m.p.h. During part of this run, a distance of 45 miles was made up a 0.4-per-cent grade in 47 min.

The locomotive also gave a good account of itself in preliminary freight service tests on the Northern Pacific, during which a total of 7,093,662 gross ton miles were handled at an average rate of 53,670 gross ton-miles per train-hour. The average speed was 28 m.p.h.,

Timken engine-truck, driver and trailer roller bearings, removed 2626 after 280,000 miles of service



Main driving wheel bearing rolls and cages, removed, cleaned and ready for inspection

the coal consumption 93.25 lb. per 1,000 gross ton-miles and the average evaporation 5.07 lb.

The test performance chart reproduced with this article shows the indicated and the drawbar horsepower obtained at various speeds during a large number of dynamometer test trips between Pasco and Lamont, Wash. It will be noted that the ratio of drawbar pull at the tender of the locomotive to the indicated horsepower developed in the cylinders was over 90 per cent at all speeds up to 40 m.p.h., and at higher speeds decreased gradually. The variation in drawbar pull from a maximum of 52,500 at 10 m.p.h. to 20,250 at 50 m.p.h. is also shown on the chart.

Materials for Boilers

(*Continued from page 388*)

per sq. in. minimum grade, reductions in weight are so evident that its attractiveness cannot be denied.

Other combinations of alloys worthy of consideration are being offered and developed for various purposes. The appreciation of improved quality is foremost today, and one of the very necessary aids for this development is the addition of wisely selected alloys. Due regard must be given, first of all, to well and carefully made steel, for just the addition of certain metals will not overcome poor melting practice. Extra care and close observation with technical control are most essential today in order to offer for fabrication and construction better and higher quality steel. The selection of base material of the proper quality must be given thought and the industry today more seriously than ever before, is, so to speak, use-minded. Consequently the opinions of fabricators and inspection groups are welcomed and encouraged in order to guide the development of either plain carbon or alloy steel since the day of special steels for almost individual purposes is here to stay.

Table II—Chemical and Physical Properties of Cromansil Steel Plates

Analysis						Thickness	Yield point	Tensile strength	Elongation percent
C.	Mn.	P.	S.	Si.	Cr.	in.	lb./sq.in.	lb./sq.in.	in 8 in.
.12	1.12	.030	.017	.55	.54	¼	60,000	80,400	25.00
.12	1.12	.030	.017	.55	.54	¾	47,100	76,300	27.00
.14	1.26	.035	.022	.77	.47	1	55,600	80,200	26.50
.21	1.17	.014	.024	.72	.47	2	53,200	85,600	20.00
.14	1.24	.010	.018	.76	.47	3	45,600	77,400	21.25
.20	1.28	.027	.018	.73	.52	1½	54,000	88,200	22.75

EDITORIALS

Marinac's Rail Oddities

Marinac is an artist and in preparing his cartoons takes liberties usually accorded artists in interpreting their ideas to the public. If you know artists; if you have ever had to serve on a committee which was attempting to deal with artists in preparing a design for a medal; or if you have come in contact with them in some competition in connection with murals in public buildings, you will understand what we mean. Marinac expressed it quite pertinently in his comment on the witty and, shall we say, rather salty letter from R. C. Bullard, published in our August number.

We can't let the artist get away with too many liberties, however, and two more of our readers take shots at him on another page of this number. I.C.C. regulations and A.A.R. standards are not to be tampered with. One way out of the difficulty might be to place under each cartoon some such statement as this: "What is wrong with this picture?", or "How many technical mistakes has the artist made in the above Oddity?"

Seriously, we have been delighted at the many expressions which have reached us concerning Rail Oddities. We made no advance announcement about this innovation, believing it would be better to try it out over a period of months and then judge it upon the basis of the reactions from our readers.

Marinac makes this rather interesting suggestion: "Why not get the active co-operation of your readers in this Rail Oddities enterprise? I will be glad to illustrate any good rail oddity or experience sent in by a reader, crediting the suggestion to him."

How about it?

Investment in Man-Power

The National Industrial Conference Board recently completed a survey in which 287 metal manufacturing companies located in 21 states, reported that the total number of craftsmen needed at once and not now available was 1,193, or 1.04 per cent of their aggregate employment. The Board estimates that if the industries of this country were operated at normal capacity there would be a shortage of about 120,000 skilled workers.

We are facing a serious situation—and for several reasons. Consider, for instance, the question of safety. The railroads have been the leaders in the safety first movement and are justly proud of the splendid records they have made. What will happen if they find themselves forced to operate shops, enginehouses and repair points under heavy pressure and with a large shortage of skilled workers?

Of what about the effect on the costs of maintenance and operation? The work must be done thoroughly and efficiently and operations must be conducted on a sound economic basis if the railroads are successfully to meet the competition of other types of carriers. How can this be done if an ample supply of skilled workers is not available when business picks up?

Many railroad mechanical department officers are concerned over the fact that apprentice training has largely been lost sight of for several years; indeed, it has almost been forgotten on some roads. Young men with good personalities and splendid educations are now available to those roads which are keen enough to go after them. The laggards in getting started on recruiting and training programs may find the field pretty well culled over if they delay much longer. Is not the present an opportune time to make a good investment in man-power?

Motor Carrier Competition

In 1913 the automobile registration in the United States was 1,258,062. In did not pass the 10 million mark until 1921, but after that year grew rapidly until it passed 26 million in 1929. It has fallen off somewhat since that time, and on January 1, 1934, stood at 23,827,000. Is it any wonder that railroad traffic, and particularly passenger traffic, has been seriously affected by this mushroom growth of a comparatively new form of transportation?

For more than a dozen years efforts have been made to have all forms of common carriers placed under federal regulation. The rapidly growing frequency of automobile accidents and the increasing cost of road maintenance caused by heavy motor vehicles, has finally forced the public to awaken to the necessity of exercising some control over the highway common carriers.

The railroads started to advocate such control many years ago, but with little success. The railroad employees, through the formation of taxpayers organizations, have been a large factor in awakening the public

to the seriousness of the situation. This was first indicated by the inauguration of motor carrier regulations in some of the states. Eventually the motor transport organizations themselves advocated regulation, because of the chaotic conditions brought about by irresponsible or fly-by-night bus and truck operators.

Congress Finally Acts

It was expected that Congress would pass a motor carrier regulatory bill early this year. Such slow progress was made, however, that it seemed for a while that Congress would again adjourn without action being taken. Fortunately the bill did pass both houses and was signed by President Roosevelt on August 9. The necessary machinery is now being set up to make the provisions of the act effective. It remains a question as to just what influence, if any, this new legislation will have on the restoration of traffic to the railroads. The bus and truck have an important place in transportation and the expectation is that the new legislation will greatly assist in adjusting the entire transportation system so that each agency may occupy that position which really belongs to it on a sound, economic basis and in the public interest.

The railroads, in both the freight and passenger departments, have recognized for a long time that they were up against serious competition and have studied in these recent years how they might improve their services in order to strengthen their position. As a result, we have witnessed the inauguration of scheduled freight trains at higher rates of speed, and various experiments with pick-up and storedoor delivery. Much has also been done to improve the equipment so that it will ride easier and protect the lading from damage.

Challenge to the Mechanical Department

In passenger traffic a distinct effort has been made to improve the comfort of travel by the introduction of air conditioning, better lighting and other conveniences, extending even to the more artistic decoration of the cars. Trains have also been speeded up and in the West and South rate reductions have been made. Some roads have specialized on transporting private automobiles over long distances, in order that they may be available for the traveler or vacationist when he reaches his destination.

In general, it is also true that the railroads are realizing that they must adopt modern merchandising methods in advertising and selling their services. All of these things, together with the fact that the other types of common carriers, which up to this time have been practically subsidized, will have to conform to reasonable regulation, promise to mean much to the railroads in their efforts to regain lost traffic and stage a real comeback as business improves.

The mechanical department can play a large and exceedingly important part in this program. New designs of cars and locomotives which will add to the attractiveness, comfort, convenience and speed of travel; equipment specially designed to handle freight from point of origin to destination expeditiously and safely; tools and facilities which will appreciably reduce the costs of maintenance and operation—all these factors will play an important part in the constructive and aggressive fight which the railroads must make in the coming days. Most of these things come clearly and entirely within the province of the mechanical department. Success will depend upon the degree to which the officers of that department visualize the possibilities and have the courage and conviction to bring these matters forcefully to the attention of the management and secure the adoption of such improvements and recommendations as may seem necessary.

Saving Fuel at Locomotive Terminals

Under the title "Fuel Losses and Fuel Wastes," the Chicago, Burlington & Quincy has recently produced the sixth edition of a 15-page mimeographed bulletin which is replete with intensely practical suggestions for economy in practically every phase of railway fuel handling. The bulletin comprises a compilation of fuel-saving suggestions advanced at fuel meetings on the Burlington over a period of several years and is used in a carefully arranged program to stimulate interest in fuel economy and make sure that this important phase of railroad endeavor is not overlooked.

A recent systematic survey of the opinions of superintendents and master mechanics on this road showed a strong consensus that the most important single factor in locomotive fuel performance is locomotive design; second, fuel purchase, distribution and inspection methods; and, third, operating methods. In other words, the mechanical engineering, purchasing and operating departments have the greatest potential influence on unit locomotive fuel consumption. Full co-operative effort is essential, however, and no details can be omitted, if the desired results are to be obtained. At locomotive terminals, for example, the Burlington booklet specifies several practices which should be avoided, such as firing up locomotives too soon; firing unevenly or too heavily; permitting green coal to be dumped with ashes into the ash pits; using insufficient blow-down, and failure to change water, or wash-out, frequently enough; failure to use stack covers when provided; failure to conserve heat in steam and water when blowing down and washing out; filling boilers with water at less than maximum temperature; excessive use of blower; placing too much coal on the rear of the coal space when full coaling is unnecessary; coaling locomotives heavier than necessary in the direction of movement of fuel in cars; failure to remove coal from tenders before placing them in storage; moving locomotives dead in trains without removing the coal or installing

the proper coal boards which would prevent the loss.

There is only one way to obtain satisfactory fuel performance and that is by a persistent and intelligently developed campaign to maintain interest in all departments. As part of this campaign, it is desirable to give wide distribution to suitable literature, set up definite fuel performance goals and provide suitable incentives to reach them, solicit fuel-saving suggestions from all employees, including the humblest, and see that these suggestions are acted on promptly.

Coach Shop Problems

A coach-shop foreman recently wrote to this department saying that elliptic truck springs of the same size and design, whether new or second-hand, frequently do not show the same deflection under the same load, and consequently it is difficult to maintain proper clearances and heights on cars passing through the shop for general repairs. In fact, he expressly stated that, in his opinion, the development and improvement in springs have not kept pace with the improvements made in other car parts. This foreman's question regarding springs was one of ten queries regarding more or less important details of coach-shop work. These questions were: "What is the best method (1) to obtain satisfactory performance from elliptic springs used in passenger car trucks? (2) To prevent two pieces of sheet metal, rolled steel, or forging from rusting at the point of contact when riveted together? (3) To overcome the rusting of metal which is laid under a composite floor, such as Flexolite or Mastikote? (4) To keep air space dry between the upper and the lower floors of a car without destroying the insulation? (5) To lay a composition floor that will not crack around the seat stands after being in service a few months? (6) To keep the dirt from entering cars at the windows and still permit operating the sash easily? (7) To repair holes in aluminum roofs? (8) To prevent excessive corrosion of steam pipes in toilets and back of hoppers? (9) To prevent small blisters from forming on the roofs of cars only five or six years old, these blisters being in the metal and not the paint? (10) To prevent the speedy deterioration of metal that comes in contact with salt water, etc., on metal floors and in the kitchen end vestibules of dining cars?"

The above ten questions show the kind of problems which are bothering one coach-shop foreman. Can you not help him by submitting answers to these questions, to be published for the benefit of all in the columns of *Railway Mechanical Engineer?* Or possibly you have some problems of your own which need solving, and an exchange of opinion would be mutually helpful. In either case, *Railway Mechanical Engineer* will appreciate an opportunity to be of service.

NEW BOOKS

STABILITY OF LOCOMOTIVES IN OPERATION. *By Y. Rocard. Published by Hermann & Company, 6 Rue de la Sonbonne, Paris. 65 pages, 6½ in. by 10 in. Paper bound booklet. Price, 15 francs.*

This booklet, printed in French, is a treatise—largely mathematical—of the forces acting upon a locomotive while in motion and their effect upon its stability. Among the factors considered are speeds, curves and reactions between wheels and rails. The basis of the treatise is the research work of M. Dantry of the French State Railway which was carried on by a commission of engineers.

RAIL MOTOR CARS (L'AUTORAIL). *Published by La Revue Petrolifere, 23 Rue de Constantinople, Paris. 150 pages, 9½ in. by 12½ in. Price, 250 francs.*

This is a special issue of La Revue Petrolifere devoted to information on rail motor cars driven by internal combustion engines and having mechanical or electrical transmissions. It should be of particular interest to anyone desiring information on the important development which has taken place recently in this field on European railroads. The illustrations, both halftone and line, are remarkably complete. There are chapters on the historical development of cars and engines, with particular attention to Diesel motors. Subjects such as the aerodynamic problems of streamlining, braking, transmission, lubrication, running gear, and light-weight construction are given attention. Following descriptions of the cars of various builders on the different roads in France information is given on the cars employed in Germany, England, Italy, Switzerland and in other countries.

THE LOCOMOTIVE CELEBRATES ALSO. *By E. Metzeltin. Published by the German Engineering Society—Vereines Deutscher Ingenieure, G.M.B.H., Berlin, N.W. 7, Dorotheenstr, 40. 88 pages, 8 in. by 11½ in. Paper bound booklet. Price 3 Reischmarks.*

This book, which is devoted to the part that the locomotive plays in the celebration of the German Railway Centenary, is anything but technical in its treatment of the subject. The text contains much of wit, jokes, caricature and ridicule, as well as praise of the locomotive. The 177 illustrations, a number of them cartoons, well depict the evolution of the locomotive from its infancy to the present day. There is also an interesting collection of opinions expressed by prominent people from 1802 till 1935, which forms a mirror of the times, although often a distorted one. While devoted largely to the German locomotives, the rest of the world has not been overlooked. Mention and frequent illustration is made of interesting or freak locomotives in other parts of the world, several of them being of American origin.

THE READER'S PAGE

Why Railroads Are Safe

To the Editor:

In looking over a copy of the July issue of the *Railway Mechanical Engineer* I saw a cartoon entitled "Railroad Oddities" by Artist Marinac where a buzzard was riding on top of a freight train. The safety department of the Santa Fe Coast Lines has taken exception to the way the cartoon was drawn. You will note that a water spout is hanging down over the top of the speeding freight train to knock off some brakeman or conductor who might be so unfortunate as to be riding on top of a car.

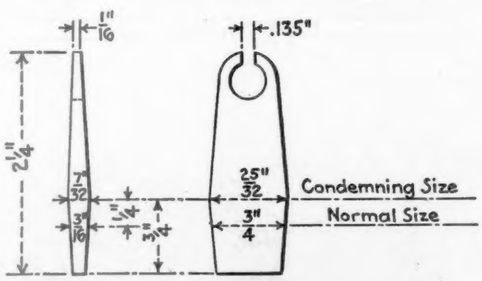
Another artist of national fame, Williams, who draws cartoons of machine shops, etc., had a habit of having his characters go to an emery wheel without putting on their goggles. I dropped that artist a little note and have observed that his characters are now living up to the rules concerning goggles.

L. H. Collett,
Supervisor of Safety, A. T. & S. F. (Coast Lines).

Have You an Answer?

To the Editor:

I believe it would be of sufficient interest to your readers to ask how they would go about making ten of these gages, also how they would go about making one thousand. The methods, of course, would vary considerable. I am submitting this because it caused



Gage for Draftac netting

quite an interesting discussion in our tool room—the best method of making ten.

I am also asking if you can give us anything of interest in boring heat-treated locomotive tires, style of roughing tools, speeds, feeds, etc., finishing process. As I am informed that these tires must have a much better, smoother finish bore than is usually to be found in the various shops, has anyone any experience in the use of the carbide tools for finishing and with what success. I have seen tires being finish bored at a speed of 180 ft. per min., 1/32-in. feed, leaving a finish almost the equal of a ground finish and looking as though it had been ground. Perhaps others have had some experience along this line. Ordinary H.S. tools will not finish properly. Then, too, there is the metallic spraying process coming along fast. What are the railroads doing with it (I do not mean in connection with tires)?

Information is also desired on the most approved method of determining the proper allowances for pressure fits of locomotive axles and crank pins in both steel and cast-iron wheel centers—not pressures, but differences in dimensions. Furthermore, should the allowance be the same if hole and axle are ground as when left with a smooth tool finish?

Shop Superintendent.

Buzzard— Or Duck!

To the Editor:

We recently had quite a discussion in regard to one of the Rail Oddities appearing on page 332 of the July *Railway Mechanical Engineer* showing Hobo, the pet buzzard, that will fly back to the station after riding freight trains out of town, the town being Lula, Ga. (I think this should be spelled Lulu).

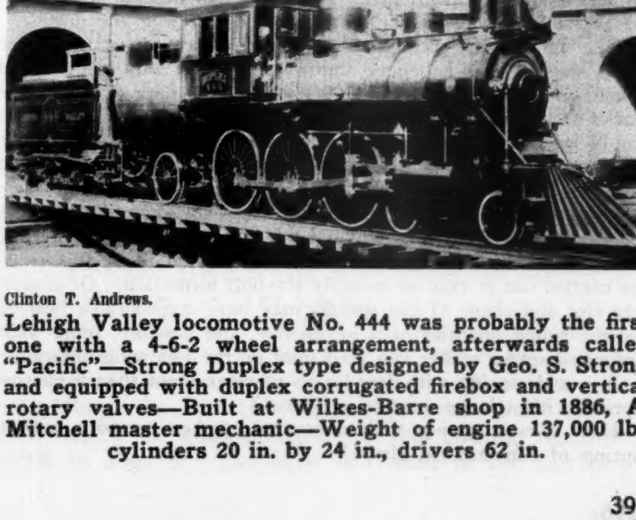
We decided on several things: First, it looks as if it is going to be Hobo's last ride because the fireman forgot to swing the water crane back out of the way and Hobo appears to be just a dumb enough cluck not to see the crane. Consequently, his tail feathers are going to get an awful smack and, if poor Hobo isn't killed in the shuffle, at least he is not going to fly for a while; that is, until he gets a new set of feathers.

Second, we think the fireman sitting on top of the tank better duck before he comes to the next water crane, if it was left in a similar position by a preceding train.

Third, we hope that no one in the Bureau of Safety will see the box car with the brake on the right side of the center line.

Possibly someone should teach Poor Hobo how to duck.

A Railroad Reader.



Clinton T. Andrews.

Lehigh Valley locomotive No. 444 was probably the first one with a 4-6-2 wheel arrangement, afterwards called "Pacific"—Strong Duplex type designed by Geo. S. Strong and equipped with duplex corrugated firebox and vertical rotary valves—Built at Wilkes-Barre shop in 1886, A. Mitchell master mechanic—Weight of engine 137,000 lb., cylinders 20 in. by 24 in., drivers 62 in.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Page Portable Boring Bar Salesman

A lot of things are being done in the name of economy that are going to prove expensive before this thing is over. An increase in fuel consumption is not entirely due to increasing the speed of trains to the point where it is necessary for the engineman to work the engine so much harder to make the scheduled time. Many locomotives have worn piston bull rings, cylinders somewhat out of round, and worn valve bushings, which have a lot to do with the increase in fuel used. A remedy for this would be to have the salesman for portable boring bars get his improved boring machine before the proper authorities on the railroad. Most every road has a lot of old boring tools—nobody knows the age of them—and the work turned out is far from perfect; indeed, there is not much inducement to do a job when it is known in advance that the finished work will be of inferior quality.

Cheap Tools Always Costly

Cheap tools are always costly. Recently I saw a tap snap off in a locomotive boiler shell while renewing studs. It was the old story: The foreman in making a lineup for the day figured it a three-hour job; it was turned into a job of six or seven hours and the incidental loss of time caused by the whole handling force having to be notified and subsequent changes made would have bought a dozen first-class taps. The "old man" says a good foreman would have foreseen this trouble and would have taken the necessary steps to avoid the delay. The foreman thinks, "Penny wise and pound foolish," but years of experience have given him the deep sagacity to say nothing, and there the matter rests.

Rough Riding Locomotives and Springs

We hear considerable comment from time to time about the hard riding qualities of different locomotives, particularly the heavier types that are being used on fast trains. Some men think it is due to the increase in speed alone, some think the track hardly as good as back in '28 and '29, and the average engineman thinks it is all due to the buffer between engine and tank being run too loose; the "stuck on tight driving box wedge" is also frequently mentioned. The thing that has me stopped is: Does the dog wag the tail, or does the tail wag the dog?

The springs are primarily put on the locomotive to absorb road shocks, and I believe improved springs will bring about some good results. Would it not be good practice to have jacks of the high-speed type in every roundhouse, so that engines could be jacked-up quickly and all the springs sprayed with a penetrating oil while the leaves are not under load; the equalizer pins should also be well oiled at this time, since we know from observation that with the bearing pressures on some of the larger classes of power the pins will not take oil under load. With the work systematically handled by men with good tools, this could be carried out at time of monthly staybolt inspection. Of course, the size and shape of the springs may have considerable bearing on the riding qualities of a locomotive, and possibly, some well-informed spring maker can shed light on the following questions:

Is a wide spring with few leaves more resilient than a narrow spring with a large number of leaves?

How does a spring with a reverse camber compare with a spring of conventional shape?

Enginehouse Foreman Resembles "Andy Gump"

Of course, the enginehouse foreman is supposed to be able to "hand it out" and "take it on the chin" in like manner, and regularly, too; but if I am seeing it as it really is, I believe the enginehouse foremen have taken it on the chin with such regularity that all of them are getting to the point where they resemble the comic strip character, "Andy Gump."

Engine "Fights" Tank

Frequently we hear the expression that an engine rides hard because the engine "fights" the tank. I'm wondering if this is all due to improperly designed buffers, or is the bucking brought about by improperly placed reverse lever, causing high compression in the cylinders and giving undesired motions at the rear end of the locomotive? Is this trouble confined to mountainous country alone, and is it also experienced on roads with more level track?

Use A Little Grease

My pet peeve is that buzzing that goes on right under the coach while the brakes are recharging, and it always comes to an end with a squeak and a groan of the brake lever dragging on the support. Somehow or other, my memory is so short I can never think to take along a grease bucket so as to be able to jump down at the third stop and grease this pesky outfit, and do everybody a good turn. There's nothing new about it, and it has been going on for years—I'm sure of that.

Further information furnished by the editor upon request

With the
Car Foremen and Inspectors

Repairing Hose at Pitcairn*

THE overhauling of air-brake, signal and steam hose, as well as metallic connectors for steam heat, is an important part of the work of the Pitcairn air-brake shop. This shop takes care of the requirements for these parts for the Central Region of the Pennsylvania and for the Altoona Works. Other shops performing similar work for other regions are those at Wilmington, Del., and Ft. Wayne, Ind. This article is divided into three sections dealing specifically with (a) air-brake hose; (b), steam-heat hose, and (c), metallic steam-heat connectors.

Air-Brake Hose

Air-brake hose is removed from service in the majority of instances for one or more of the following defects illustrated in Fig. 2: (1) holes in the outer cover and torn or rotted fabric at the hole; (2) longitudinal cracks or spiral seams; (3) soft bends; (4) broken clamps; (5) defective nipples; (6) worn or distorted couplings; (7) hose which has burst in service. Hose

* This is Part I of the fifth of a series of articles dealing with repair work at the P. R. R. Pitcairn air-brake repair shop. The fourth article appeared in the June issue. Part II, covering work on steam heat hose and metallic connectors will appear in October.

Container loaded with air-brake hose to be repaired

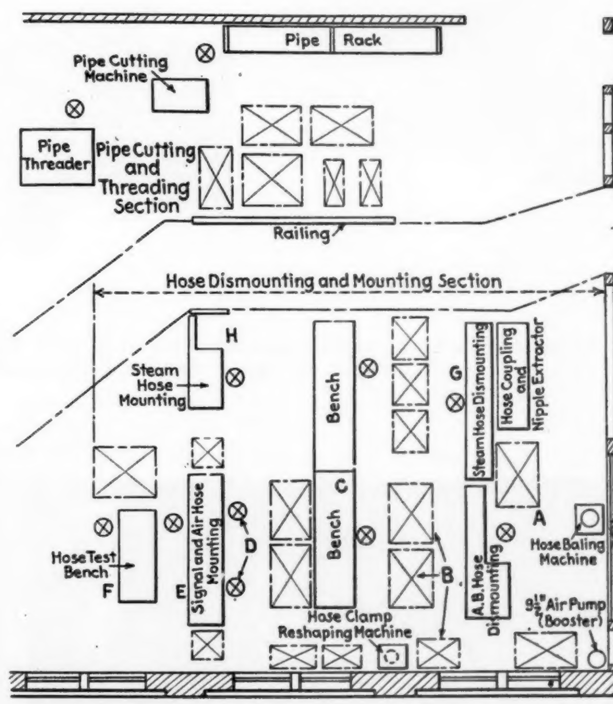


Fig. 1—Arrangement of benches and location of workmen in hose-repair section of Pitcairn shop

which has been removed from cars or locomotives throughout the Central Region is shipped to Pitcairn and unloaded from cars into a rack type of container which, by means of gasoline lift trucks, is carried to the section of the shop in which the work is to be performed. The relation of this section to the rest of the shop is shown in the layout of the shop which appeared in the March issue of the *Railway Mechanical Engineer,* and an enlarged view of the hose dismantling and mounting section is shown in Fig. 1. The containers loaded with hose for repairs are taken to this section and spotted at location *A* (Fig. 1). The workman first makes a visual inspection of the hose and, if no serious defects are apparent, it is laid aside for test. If this visual inspection does disclose defects, the hose is dismantled. In dismantling, the first operation is to remove the clamp bolts, which is accomplished on the cutting machine shown in Fig. 3. The hose is placed in the machine

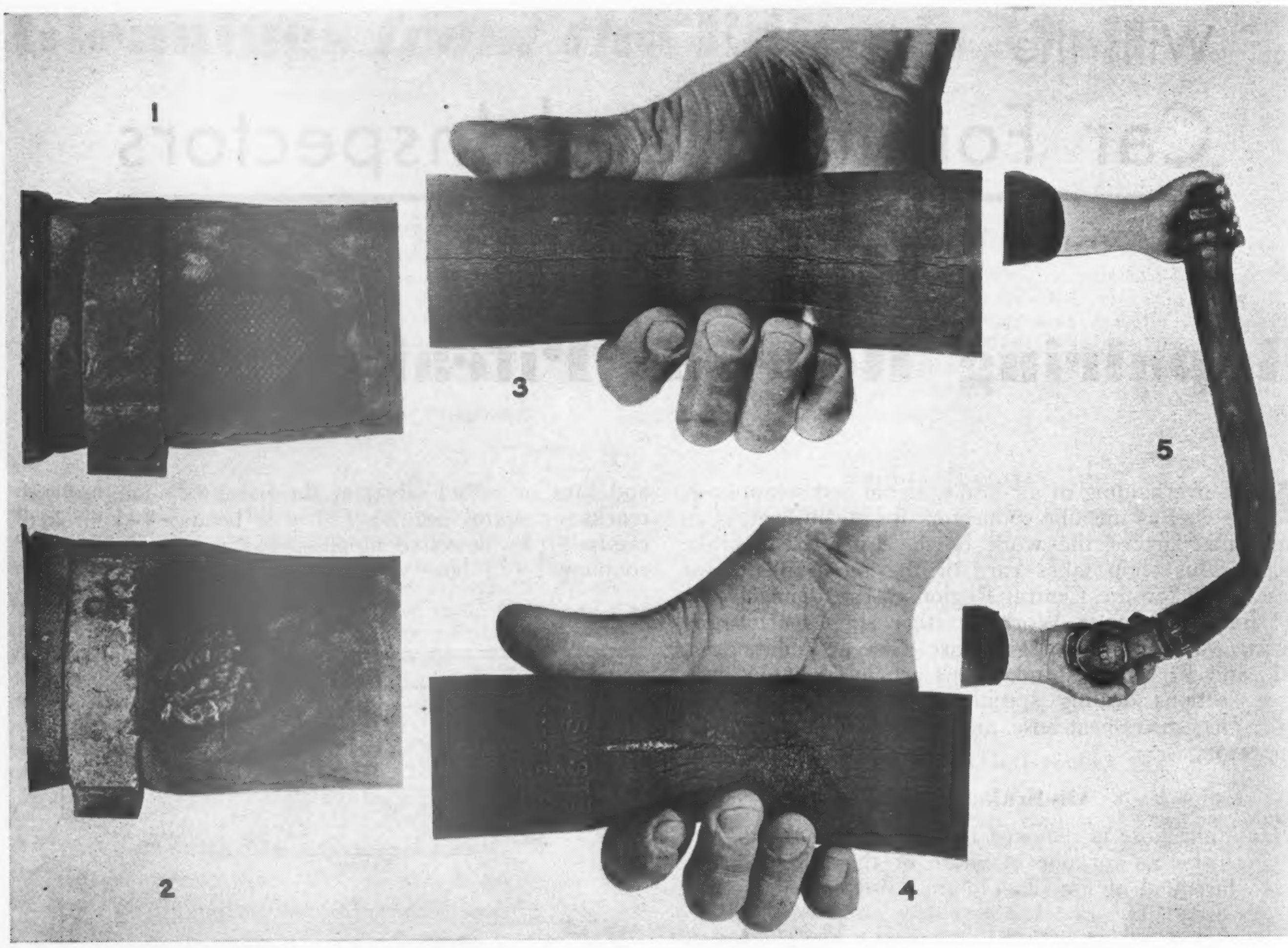


Fig. 2—Examples of defective air-brake hose—(1 and 2) Holes in outer cover and fabric at the hole torn or rotted; (3 and 4) longitudinal cracks; (5) an example of a soft bend

Fig. 3—Cutting machine used for removing hose clamp bolts

in a vertical position with the bolt resting on the lower cutter edge. The back end of the upper edge is connected to a piston and rod which operates in a small cylinder and is controlled by a hand-operated straight-air brake valve. The hose coupling and nipple are then removed from the tube on a dismantling machine which is shown in Fig. 4. The nipple end of the hose while in a vertical position is pushed over a latch and pin in the machine, the latch dropping into place when the hose is allowed to fall to a horizontal position. In doing this the rubber hose drops into the holding jaws and the coupling is received in a steel block. The operator, by moving the control valve, causes a piston to move

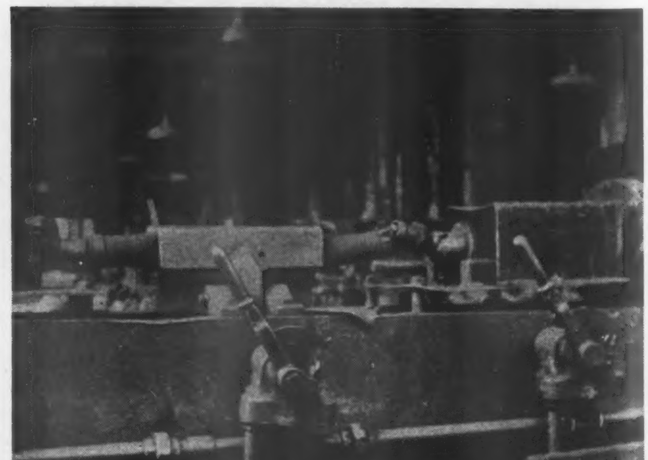


Fig. 4—A hose in the dismantling machine showing how the fittings are pulled from the hose

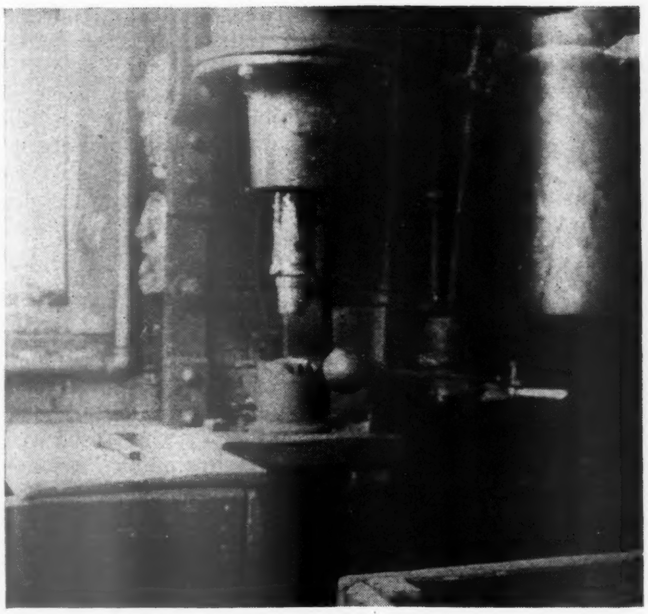


Fig. 5—Machine in which damaged hose clamps are straightened

and clamp the tube and the operating valve controlling other operating cylinders causes the pin and steel block to move in a direction away from the center, thereby removing the coupling and the nipple from the tube.

Inasmuch as the bolts have previously been cut in two, the clamps are now pulled by hand from the rubber tube and, along with the coupling and the nipple, are

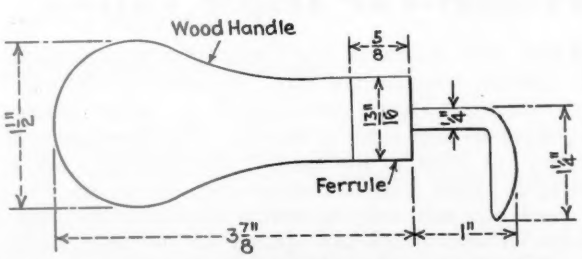


Fig. 6—A tool for cleaning gasket grooves in air-hose couplings

Fig. 7—Machine used for placing the fittings in the hose

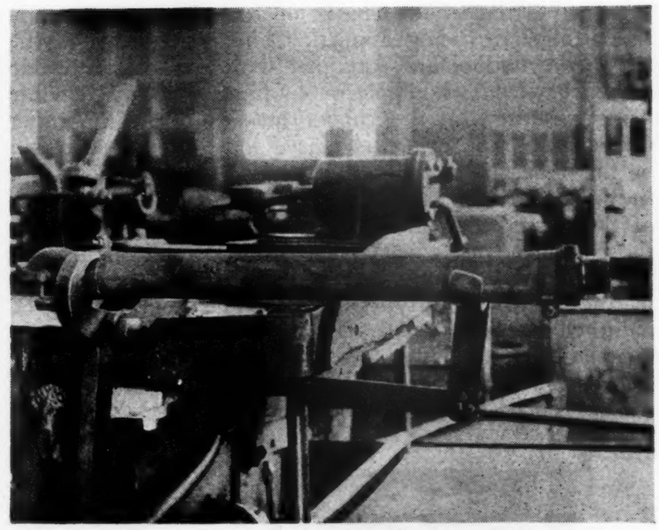


Fig. 8—Hose in the clamping machine with the clamp forced into a closed position ready for the bolt

placed in bins located at *B* (Fig. 1). Here the clamps are re-formed in a machine which is shown in Fig. 5. This machine consists of a cylinder and a piston in a vertical position. The end of the piston rod is fitted with a flanger of such shape as to conform to the proper contour of the clamp. The clamp is placed in a die block and the flanger, which is controlled by air pressure, moves down into the clamp, restoring it to its original shape.

How Nipples and Couplings are Repaired

A workman at *C* (Fig. 1) makes repairs to nipples and couplings. The nipples are carefully inspected and, if badly rusted or otherwise unfit for service, are scrapped. If the sleeve end has any sharp or raised portions, they are properly dressed. The rethreading of nipples is accomplished by a threading arrangement consisting of an air motor mounted on a bench, the back portion of which is equipped with a holding receptacle in which the hose end of the nipple, as well as the hexagonal portion, are inserted. As the nipple revolves with the receptacle, a removable die block operated by a hand lever is fed slowly over the threads of the nipple. The couplings are checked with two standard A.A.R. gages, the first of which is a minimum gage which should enter the coupling, and the second a maximum gage which must not enter the coupling. Should the first gage fail to enter the coupling, a wedge is used to increase the coupler dimension so that the gage will enter, and if the second gage, which ordinarily must not enter the coupling, is found to enter, the distance is decreased by a few hammer blows on the short arm of the coupling. Gasket grooves are cleaned out by the tool shown in Fig. 6. If the groove is worn or pitted, the coupling is scrapped. The guard arm pin is carefully inspected and, if it is found distorted to any extent due to rust it is removed. In every case it is properly secured in the coupling by two or three center punch marks placed in the coupling arm close to the end of the pin. The sleeve end of the coupling is dressed if any sharp or raised portions exist.

The hose fittings, after being repaired, are placed in bins at location *D* (Fig. 1). Here, a mounting device, shown in Fig. 7, consisting of a Z-bar frame, a hand-operated clamp, two compressed air cylinders, and an operating valve is used to mount the hose. The hand clamp is designed to grip the rubber hose throughout the

greater portion of its length, or to hold it rigid while the fittings are being applied. The piston rods of the two air cylinders are equipped with special removable heads to which the nipple or coupling is attached while being mounted on the rubber hose. In the mounting operation a hose clamp is placed loosely over each end of the tube which is then placed in the lower half of the hand-operated clamp with the trade mark to the left of the center and directly on top. The hose clamp at the coupling end is placed with the opening on top and the one on the nipple end is placed with the opening in the clamp directly opposite. The coupling to be mounted is placed on the special head of the mounting machine, after rubber cement has been applied to the sleeve end as well as a small amount put into the end of the rubber hose. This cement not only serves as a

Fig. 9—Soap-suds test of the mounted hose

lubricant, but also aids in assuring an air-tight and rigid joint. The clamp lever on the machine is then drawn down by hand in order to hold the hose rigid and the air operating valves are opened to admit air to the cylinders successively. This causes the pistons to move toward the center, forcing the coupling and the nipple into the hose. The air pressure used on the cylinder is limited to 90 lb. and only one fitting is applied at a time. This precaution is taken to avoid injuring the vulcanized surface of the rubber-hose ends which would be likely to result if the fittings were forced into the hose too violently, or if both the coupling and the nipple were jammed into the hose simultaneously.

Placing Fittings and Testing Hose

After the hose are mounted they are passed over to location *E* (Fig. 1) where the hose-clamping device is located. This device is shown in Fig. 8. The hose is laid on the support with the hose clamp between the jaws of the device. Particular care is taken to see that the clamp is placed midway between the raised portion of the fitting and the hose end and not directly on the raised portion. With the clamp so placed as to have the lugs resting on the jaws the feed operating valve is moved to the application position and the piston rod moves out, causing the jaws to close on the clamp. Just as this is done a light hammer blow is delivered on top of the clamp tongue, causing it to turn under the opposite end of the clamp. Clamp bolts are applied while the clamp is being held in this position and the nuts are run on with a small brace wrench. The completed hose is then passed over to the test bench at *F* (Fig. 1). In order to insure that no restriction exists in the mounted hose, a small steel ball is passed through the hose and its fittings. The coupling on the hose is then connected to a similar coupling attached to an air line carrying 140 lb. pressure and a pipe cap is screwed onto the nipple end. With the pressure applied a soapsuds test is made as shown in Fig. 9 and, following the test, hose which has passed inspection is placed in a rack or container for delivery to the stores department. The Pitcairn shop repairs an average of approximately 4,000 air-brake hose and 500 signal hose per month. The practice in connection with the repair of signal hose is identical with that described for air-brake hose, except that the various devices used in connection with signal-hose repair, while somewhat smaller, are practically of the same design. For this reason no detailed description is given in this article of signal-hose repair.

(*To be concluded in the October issue*)

Storage Rack for Freight-Car Triple Valves

THE rack shown in the illustration was devised by one car foreman and has a capacity for racking 200 triple valves. Three sheets of ¼-in. boiler plate are flanged on all four sides as shown. The dimensions after flanging are 36 in. at the base, 12 in. at the top, and 6 ft. in height. Five strips of strap iron, ½ in. by 1½ in., are used on each side to secure the three uprights together. These straps are spaced 15 in. apart and are riveted to the upright. They also act as supports for the triple valves which are hung on the straps by the check-valve case. There is absolutely no danger of a valve falling for the reason that the check-valve case must be lifted clear in order to remove it from the rack.

This rack holds 200 triple valves in a safe position

Further information furnished by the editor upon request

Decisions of Arbitration Cases

(The Arbitration Committee of the A. R. A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Repair Bills on Authority of Defect Cards By Other Than Owner—Paint Damaged by Fire

Defect cards were issued under the rules of the Chicago Car Interchange Bureau against the Chicago & Illinois Western for paint damaged by fire on sides, ends and sills of 38 L. & N. and 3 S. L.-S. F. hopper cars. The Chicago, Indianapolis & Louisville, in whose possession the cars were when defect cards were issued, painted the burned parts and rendered bills, amounts $4.50 and $130.43, against the C. & I. W. to cover. The C. & I. W. contended that painting was not necessary for safety of trainmen or lading and as the C. I. & L. was not the owner, they were not authorized by any interchange rules to make repairs and render bills. The C. I. & L. contended that regardless of the fact that repairs were not necessary for safety, they were responsible for condition of all cars on their line and accordingly were justified in billing for the work performed.

The C. & I. W. in joining in an appeal expressed the opinion that the C. I. & L. were not authorized by the rules as based on paragraph A and footnote thereto of Rule 1, the last sentence of paragraph B of this rule and on Rule 16. Paragraph A requires that each road give all cars on its line equal care as to inspection, oiling, packing and running repairs. The footnote defines running repairs, which are the only repairs permissible under this paragraph, as those ordinarily required to trucks, brakes, draft members, couplers, draft gears, and safety appliances. The last sentence of paragraph B, Rule 1 and Rule 16, limit repairs which carriers may make to foreign cars to the minimum necessary for safety of lading and trainmen. It is the opinion of the C. & I. W. that these rules clearly indicate the intent that carriers may repair only such defects as constitute a safety hazard and while they refer to owners' defects, the intent should be the same where defects are delivering line responsibility. The defects on the cars referred to consisted of paint burned from certain metal parts. This damage would not prevent the safe operation of the cars and there was no practical reason why repairs could not have been deferred until the cars reached home line. They, therefore, considered that the C. I. & L. exceeded their rights in repairing the cars and that charges should be cancelled.

The Chicago, Indianapolis & Louisville stated that when repairs were made the cars were on their line transporting coal from mines to Chicago. As long as cars were in service on their line, they considered it their duty to give such cars equal care as to inspection, oiling, packing and running repairs. These cars, when being unloaded by industries in Chicago on the C. & I. W., were damaged by fire to an extent that it was deemed necessary to paint them to preserve the metal parts damaged from further deterioration. Chicago Car Interchange Bureau defect cards were issued against the C. & I. W. and the C. I. & L. elected to make the necessary repairs rather than order cars home and have them removed from revenue service. Rule 16, mentioned by C. & I. W. as limiting repairs which carriers may make to foreign cars, applies only to owner's defects. This rule does not permit repudiation of defects when repairs are made by other than owners. In fact, the Arbitration Committee has already placed itself on record that defect cards once issued cannot be repudiated. As far as delivering road is concerned, it does not matter who makes repairs on authority of their defect cards—the owner of the cars or some other carrier. A letter from the owner, the L. & N., stated: "If the repairs made by you on authority of defect card conforms to the original construction of the cars (two coats of paint), I do not see where we have any right, under the interchange rules, to object to your making the repairs." In view of the fact that defect cards were issued for delivering line defects the repairs were made to conform to original construction of the cars and the L. & N. permitted the C. I. & L. to make repairs, the C. I. & L. were pleased to join the C. & I. W. in presenting the case for consideration.

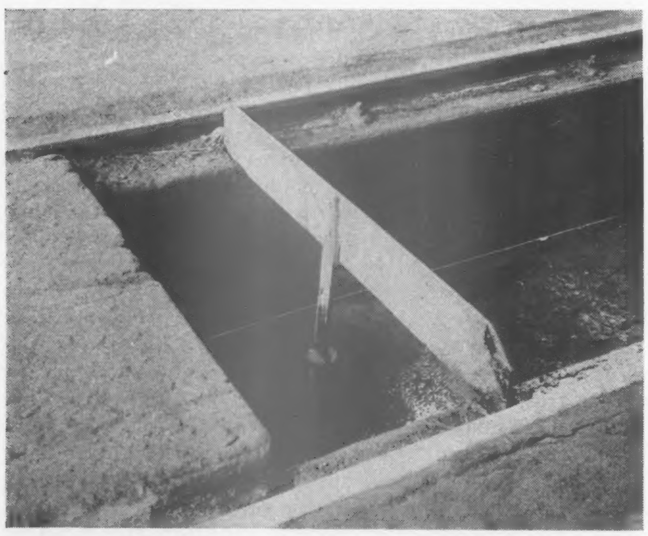
In a decision rendered November 8, 1934, the Arbitration Committee said: "Instead of making repairs, the C. & I. W. delegated the work through the issuance of its defect cards. While Rules 1 and 16 do not authorize repainting of foreign cars simply for the purpose of preventing deterioration, the repairing line evidently felt that it was serving the best interests of the car owner and, as no evidence is presented to indicate car owner's objection to action of repairing line, bills as rendered on authority of the defect cards should be honored."—*Case No. 1739, Rules 1 and 16, Chicago & Illinois Western vs. Chicago, Indianapolis & Louisville.*

In the Back Shop and Enginehouse

Two Convenient Enginehouse Devices

TWO devices which give good service at enginehouses and also at back shops, but which are perhaps most helpful in the former, due to more frequent use, are shown in the illustrations.

The first consists of a swinging gage, installed in a



Swinging gage for checking locomotive rail clearance

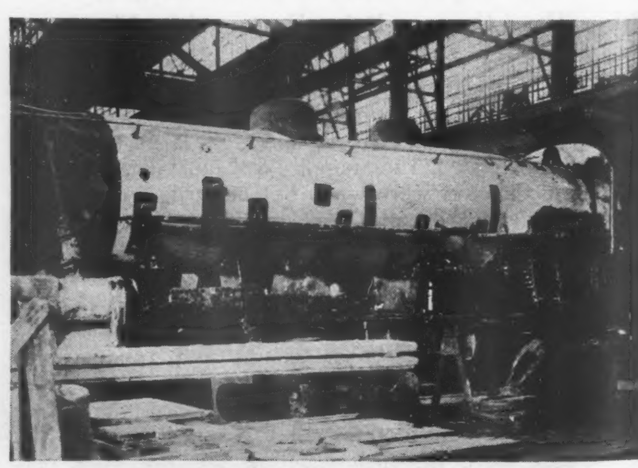
track pit and provided with a counterweight which extends down into the pit. This gage is designed to show that any locomotive passing over it without contacting the gage meets the I. C. C. rail clearance limit requirements. The gage is made of a piece of sheet metal hinged at each end and set with its upper edge 2½ in. above the rail level. A short arm and counterweight are bolted to the gage, as shown, to keep it in the upright position normally, but provide a yielding resistance should any obstacle strike it. By watching the gage while a locomotive passes over it, any swinging of the gage and counterweight would indicate insufficient clearance of some locomotive part which must be corrected. The gage can be installed in any pit in the enginehouse or in the outside inspection pit, if preferred.

The other device, illustrated, consists of two small steel bars, each of which is provided with a drilled lug on one end to engage a back valve-chamber-head stud and made long enough to rest on, and extend out over, the bumper beam or uncoupling lever rod. Two small chains limit the spread of these steel bars to a maximum of about 10 in. when supporting a locomotive main valve, as shown in the illustration. This device is valuable because it facilitates removing and re-applying the relatively heavy main piston valves, which must be done with considerable frequency in enginehouse work.

Double-bar device which greatly facilitates removing and reapplying main valves

Lagging Application

THE method of applying J.M. asbestos lagging to a locomotive boiler at the shops of a large midwestern carrier is shown in the illustration. When a locomotive is received at the shop and requires a class of repairs which necessitates lagging removal, the old lagging



J. M. asbestos lagging applied to the barrel of a locomotive shopped for heavy boiler repairs

is stripped off, soaked and about 60 per cent prepared for reuse on the locomotive, the other 40 per cent being new lagging.

In application, the first operation is to apply a thin coat of new lagging, in a plastic condition, approximately ¼ in. thick to the boiler. This is done after the boiler has been thoroughly heated by being filled with hot water and steam for the boiler test, the heat having the effect of rapidly drying the lagging and helping to hold it in place. The first coat is usually applied from the bottom up in order that boiler makers may have as long as possible to inspect for leaks along the top of the boiler. However, the application may be from the top down, in case the boiler has already been tested and found O. K.

The second coat of lagging, applied to the barrel of the boiler, consists of a filler coat of old or mixed old and new lagging at least an inch thick. This coat is usually applied from the top down and on being dried is reinforced or held in position with circumferential wires spaced about 1 in. apart along the barrel of the boiler. A final coat of lagging, which is new lagging mixed with about 25 per cent of sawdust and shavings, is then applied to the barrel of the boiler, bringing the lagging thickness up to from 1¾ in. to 2 in.

Molded asbestos is used on top of the boiler and between the staybolt caps, being covered with a light coat of plastic asbestos, applied by hand to fill the cracks. It takes about three days for two men and a helper to apply the lagging to a locomotive boiler of the size indicated in the illustration.

Wheel-Center Repair Job

WHEN one or more of the short spokes between the hub and the counterweight of a locomotive main driving wheel becomes cracked in service, considerable difficulty is frequently experienced in making sat-

Wheel center with welded plates replacing cracked short spokes

isfactory repairs by welding, owing to the difficulty in taking care of expansion. The repair method, shown in the illustration, has been used successfully at the West Burlington (Iowa) shops of the Chicago, Burlington & Quincy. It consists essentially of burning off the three short spokes flush with the wheel hub and the counterweight and substituting for them two 1¾-in. thick steel plates, cut to shape and welded in place, one on the inside face and one on the outside face of the wheel center. This gives, in effect, a box construction which is much more reliable and far stronger than the original spoke design.

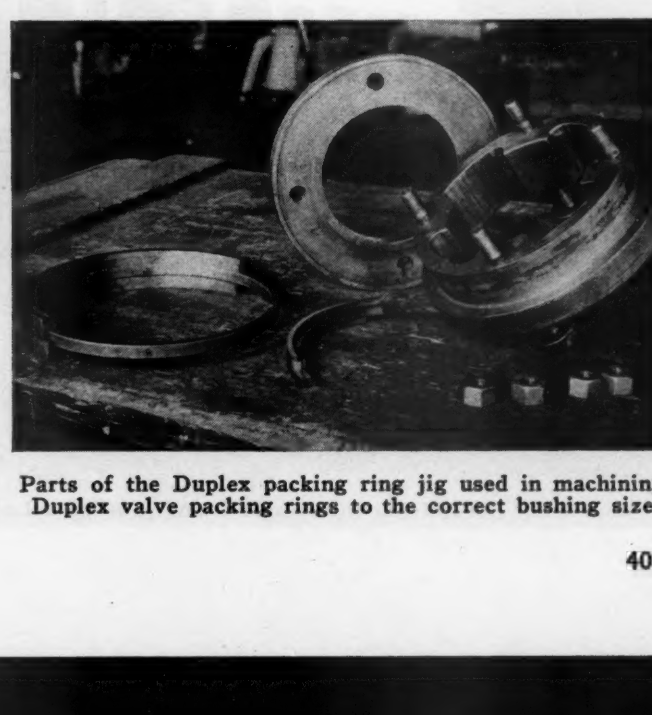
The general method of procedure in making this kind of a wheel-center repair job is as follows: After the short spokes have been cut off with the oxy-acetylene cutting torch, two 1¾-in. steel plates are cut out with the torch to fit the spaces between the wheel hub and the counterweight. These plates are of the same general shape, but not identical in size, since they must conform to the slightly varying section of the wheel hub. Both edges of the plates to be welded are chamfered to an angle of approximately 40 deg. to make room for proper manipulation of the welding torch and to give an adequate volume of deposit metal. Sure Weld No. 155 coated welding rod is used.

To support each filler plate flush with the upper surface of the wheel center, during the welding operation, two ½-in. steel rods are first welded, one to the wheel hub and one to the counterweight, 1¾ in. down from the top surface. Preliminary to the actual welding, the wheel spokes and rim are heated at points *XXXX* and *RR* (one *R* not shown in this illustration) by a charcoal fire and kept hot during the welding operation so as to make necessary provision for contraction when the welds cool. The wheel center is subsequently normalized to relieve all lingering internal stresses. If necessary, the wheel center is turned to make sure that the rim is accurately round, true and concentric with the axle bore.

Chucking Jig for Turning Duplex Packing Rings

A SPECIAL chucking jig, used at the Chicago shops of the Chicago & North Western for turning the outer diameters of Hunt-Spiller Duplex sectional valve packing rings, is shown in the two illustrations. These packing rings, consisting of eight rings per valve chamber, four sections each, are purchased $\frac{1}{16}$-in. oversize and when applied are turned to a true circle on the outer diameter to fit the valve chamber bushing accurately.

This chucking jig consists of a main arbor, a spacing



Parts of the Duplex packing ring jig used in machining Duplex valve packing rings to the correct bushing size

ring and a circular cover plate, which is held in place when the jig is assembled by means of four studs and nuts. The packing rings are accurately positioned by means of undercut grooves in the arbor and the cover plate. The spacer rings assure holding the ring segments parallel when assembled in the chuck. When the cover plate is applied and the bolts tightened, the chuck is ready for mounting on the lathe spindle, after which

The Duplex packing ring jig assembled in lathe ready for finishing cut on the ring diameter

a light turning operation or cut is made to reduce the exterior diameter to the proper size.

Duplex valve packing rings finished by this means are an accurate fit in the valve chamber bushings, an important factor in fuel economy. The use of the chuck illustrated also saves considerable setup time over most of the methods commonly used and assures an unusually accurate job.

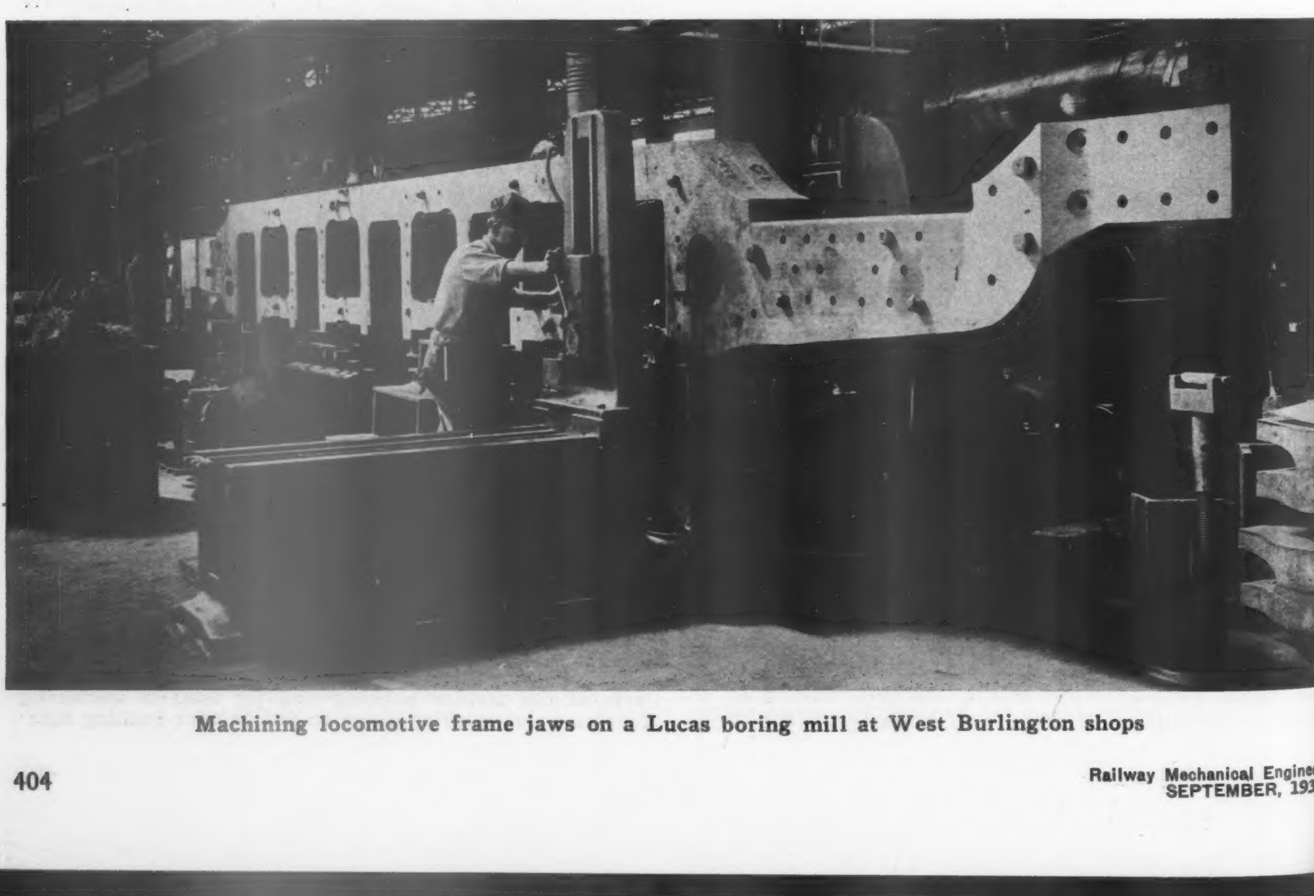
Milling Locomotive Frames

ONE of the most important jobs in connection with the application of Timken roller bearings to six locomotives at the West Burlington (Iowa) shops of the Chicago, Burlington & Quincy is the attachment of

Close-up view of frame-jaw milling operation

steel wedges permanently to the wedge sides of the main frame jaws by welding, and milling enough stock from the straight jaw sides to provide the necessary pedestal jaw width for the larger roller-bearing driving boxes.

The work is done at West Burlington on a Lucas boring mill, two frames—each 7 in. thick—being bolted together and machined at one time, as shown in the illustrations. In spite of the heavy sections provided



Machining locomotive frame jaws on a Lucas boring mill at West Burlington shops

in these frames, their great weight will cause a certain amount of spring and consequent variation in jaw width unless the frames are supported at more than one point outside the boring mill. To prevent this spring and assure the desired accuracy of not less than .015 in., two substantial outboard bearings are provided, as illustrated. Suitable rollers permit necessary frame movement in a horizontal direction under the action of the milling machine feed.

The type of solid spiral milling cutter used is indicated in the close-up view, which shows the operation of milling a total jaw width of 14 in. Cutting feeds and speeds are adjusted to remove the maximum amount of metal practicable within the capacity of the machine and assure the desired accuracy and smoothness on finish cuts. One-half inch of metal is removed from the shoe side of main jaws and ¼ in. from the shoe side of all other jaws. The wedge sides are simply cleaned up. A fly-tool is used for enlarging the corner fillets.

The tank and hose connection for supplying cooling compound during the milling operations is illustrated. It is necessary to machine the frame jaws in this job to unusually close tolerances, as mentioned, to assure an accurate fit with the roller-bearing journal boxes. To provide sufficient depth for these boxes, it is also necessary to mill ½ in. off the upper surfaces of the pedestal binders.

Lubricator Testing Device

THE importance of making sure that mechanical lubricators on modern high-speed locomotives are functioning properly can hardly be overestimated. The best, and in fact about the only practicable, means of determining exactly what a lubricator is doing is to make a shop test on a lubricator-testing machine. Such a device, used at the Silvis (Ill.) shops of the Chicago, Rock Island & Pacific, is shown in the illustration. It consists of a suitable bracket for mounting the lubricator at a convenient height above the work bench, the lubricator feeds being connected to terminal checks which are set at 300 lb., individual gages being arranged to show the exact working pressures.

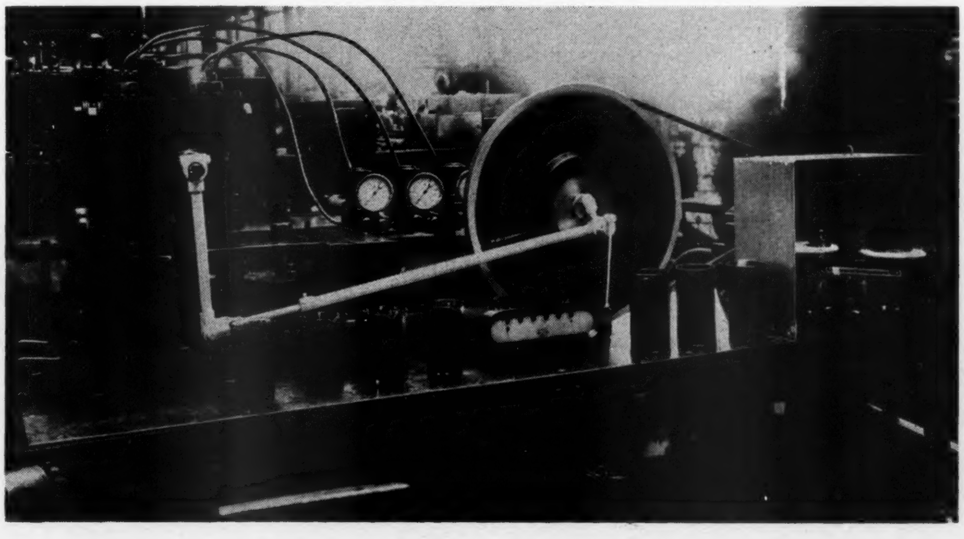
Mechanical drive is provided by means of a V-belt drive from a small electric motor (not shown) to a large pulley equipped with crank arm and adjustable rod connection to the lubricator drive shaft. The motor speed and pulley diameters are adjusted to give the equivalent of 40 m.p.h. locomotive speed. The throw of the crank arm is 7½ in. A stroke counter is provided, suitably connected to the crank arm, as illustrated. The number of revolutions of the lubricator cam shaft is shown by a revolution counter installed on top of the lubricator. An alcohol lamp heater, located at the rear of the test rack under the lubricator, is adjusted to maintain the oil at a temperature of 130 deg. F.

In the left foreground are the measuring glasses which were formerly used to collect the oil from the individual feeds and give a check on the oil delivered from each feed per minute. This method was found to be less convenient and accurate, however, than to weigh the oil, which is now done by means of balanced copper cans shown. These are used to catch the oil which is then weighed quickly and to within an accuracy of .1 gram on the balance scale, shown in the sheet-metal box at the right in the illustration.

By using this test machine, it is possible to determine definitely whether or not each feed of the lubricator is delivering oil within the maximum and minimum limits specified for that particular type of lubricator. The lubricators are tested after being thoroughly overhauled and reconditioned and any found deficient in performance are returned to the lubricator department for the repair and replacement of defective parts.

After lubricators are finished and tested they are shipped in a special packing box which properly protects the lubricator from damage any way while enroute. Each box is so arranged as to take any one of three types of lubricators. Maintenance costs are considerably reduced due to the fact that expert labor and centralized material is naturally brought about. Loss of usable parts is minimized due to the fact that all lubricators are shipped intact and all parts are carefully checked and in many instances reclaimed, so that there is no waste from the scrapping of still serviceable parts.

OLD LOCOMOTIVE HONORED.—The apartment building in Chicago, known as 999 Lake Shore drive, is not, as might be supposed, situated at 999 Lake Shore drive. Its correct number is 239, but it was named 999 in honor of the New York Central locomotive 999 which made a famous high-speed run years ago.



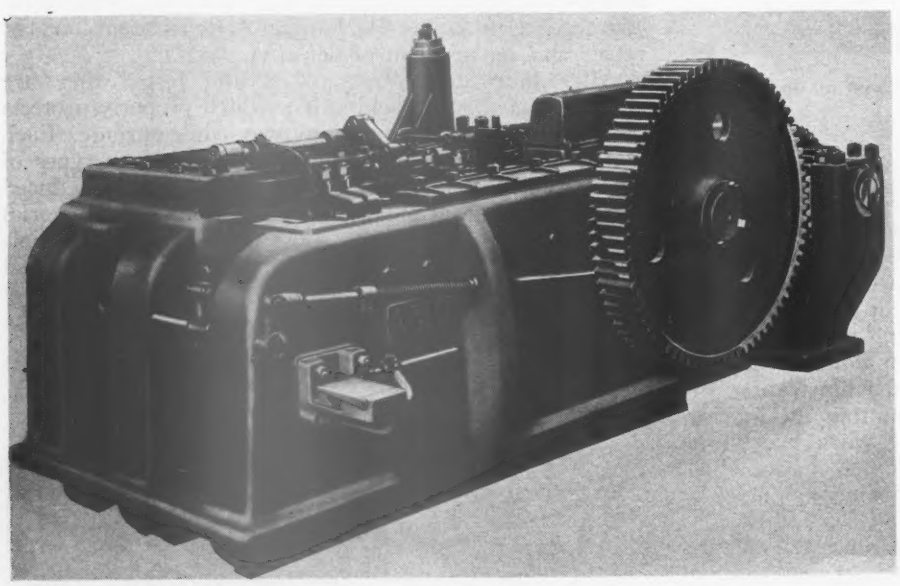
Equipment used in testing mechanical lubricators at the Silvis shops of the C. R. I. & P.

New

Shop Tools and Equipment

Cushioned Drive Forging Machine

The Acme Machinery Company, Cleveland, Ohio, has recently developed an all-steel forging machine which features a friction cushioned drive. With this type of drive, a slight pressure on the foot-treadle starts the machine instantaneously and smoothly; no time is lost waiting for a partial revolution of the driving gear. This clutch arrangement also cushions the starting and stopping action, eliminating shock to the machine and motor. In case of an overload, the clutch cushions the shock on the flywheel as it stops and relieves the strain on the crankshaft and other parts. The clutch is of simple design, the flywheel being the only rotating member when the machine idles. The instantaneous starting results in a reduction to a minimum of the heat loss in the metal being worked. The absence of back lash due to the positive movement of the heading tool to and from work permits the metal to flow uniformly and eliminates the tendency for the crank, after passing the center, to recede ahead of the driving member.



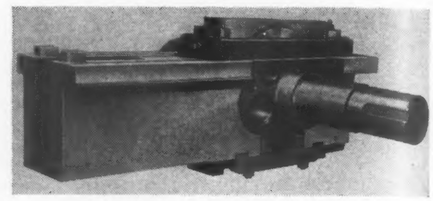
Acme cushioned-drive forging machine

The clutch discs are made of high-grade aluminum alloy because of its high conductivity of heat. These discs are cored to permit a constant flow of air through the center, which dissipates the heat generated by the friction surfaces, resulting in low clutch temperature during operation. The clutch and brake on the smaller machines (2 in. and under) are mechanically operated by means of a single cam. On the larger machines ($2\frac{1}{2}$ in. and up) clutch and brake are air-controlled through a single piston. This construction eliminates the necessity for an extra hand brake. The air-controlled clutch facilitates die setting, since it permits moving the machine slowly through an entire cycle.

The bed is a steel casting, of one-piece box type construction, additionally strengthened by heavy longitudinal and transverse ribs. The bed carries three large main crankshaft bearings so constructed that when the caps are bolted in place it forms a straight-line bed. The operating side of the bed is so designed that the operator can work close to it.

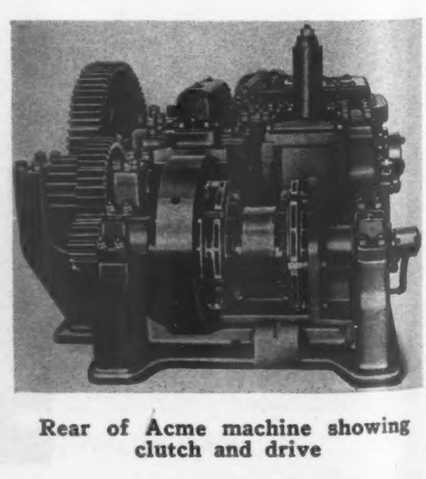
The main shaft is an alloy steel forging, heat treated. The shaft, being an eccentric type, permits a large bearing area in the sliding head which results in low bearing pressures. This construction, together with the solid eccentric, eliminates crank shaft deflection under heavy stresses, also the tendency to ultimate fatigue and failure.

Acme forging machines are double back geared with outboard bearings for most of the trunnion shafts. This double back gearing gives a much greater gear ratio between the crank and flywheel with its resultant power increase. The gears are steel castings and the pinions steel forgings, both having accurately cut teeth. The driving flywheel idles on anti-friction bearings on the driving pinion shaft. The steel header slide is of the full suspended type, with the horizontal surfaces in a single plane suspended both sides of the shaft. This construction contributes to the maintenance of accurate header tool alinement. The long, wide, horizontal supporting surfaces are lined with bronze and slide on hardened and ground steel liners accurately fitted to the bed. Hardened and ground inserts are provided as bearings for the large bronze faces of the sliding box. A long adjustable taper gib takes up any wear both on the vertical flat sliding head surfaces and in the large eccentric bushing. This design affords easy and quick adjustment between shaft and header slide.



The crank and header slide arrangement

Several advantages claimed for the Acme patented sliding head movement for operating the header slide are increased power; the elimination of the Pitman movement and the substitution of the large-area sliding head with its resultant lower bearing pressures; the absence of a tendency, when heading tools are placed above the center line of the shaft, for the front end of the header slide to lift up



Rear of Acme machine showing clutch and drive

and any tendency for the rear end to raise when the tools are located below the center line of the shaft (this assures accurate alinement of heading tools through the complete cycle of stroke), and the use of an adjustable taper gib which permits taking up play on the large flat sliding head surfaces and wear in the larger circular eccentric bearing. With the same power input at the center of the shaft, the Acme sliding head movement is said to deliver from 15 per cent to 20 per cent more power to the header slide.

The movable die slide is of steel and has the same suspended type slide features as the header slide. It has long, wide bearing surfaces faced with bronze wearing strips. The side wearing plates are accurately ground and fitted. The movable die is cradled in a hardened and ground plate attached to the movable die slide and operates against a breast plate. This permits adjustment of movable die, longitudinally, when necessary, to match the position of stationary die and eliminates wear between the movable die and the breast plate.

The toggle slide, toggles and automatic relief units are practically of the same design and construction as employed in models recently manufactured by this company.

This company will be an exhibitor at the Machine Tool Show.

Saddle Type Turret Lathes

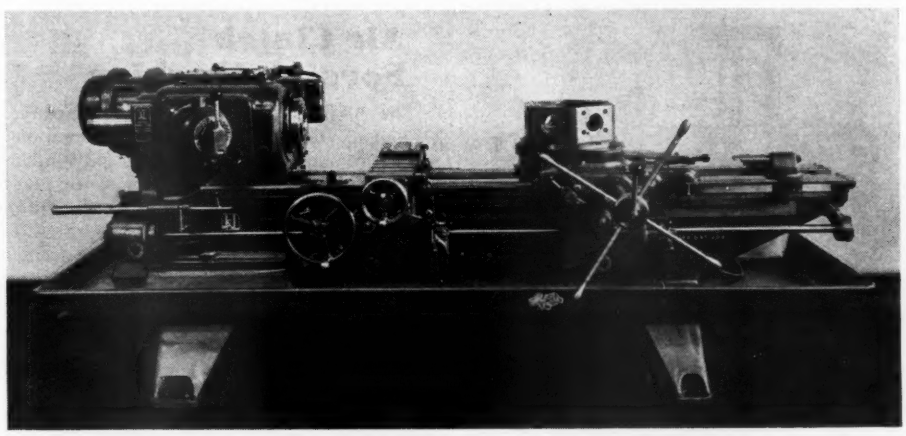
The Jones & Lamson Machine Company, Springfield, Vt., has announced a new line of saddle type turret lathes. They are built in a 2½ in. bar capacity and are fitted with 12 in. chucks when they are used for chuck work.

The machines are equipped with the following features: Single lever speed and feed selectors with direct reading dials. Twelve spindle speeds forward and reverse. All variable speeds are obtained through sliding gears mounted on multiple splined shafts. All gears and shafts in the headstock are hardened, and all shafts are mounted on anti-friction bearings. The main spindle is the flanged type with a taper pilot and is mounted on anti-friction bearings set up under a pre-determined load. All wiring for the machines is built into the headstock, with the control panel located near the operating position.

The bed is a double box ribbed construction and is equipped with hardened ways. The ways are continuous hardened pieces running the full length of the bed and bolted into position against alining shoulders with vertical and angular bolts spaced 4 in. apart. These ways are so designed as to provide the bearing for the saddle and carriage on the top of the ways and the alinement against the vertical side of the front way. All hold-down gibs are clamped against hardened surfaces.

The universal carriage is equipped with a heavy duty slide for mounting of tools on the front and back. It has a spool stop for all longitudinal movements and a spool stop for the cross feed, which will disengage the feed in either direction. All feeds are disengaged against positive stops. The apron is equipped with a sliding gear transmission of nine variable feeds. A thread chasing attachment can be installed on this unit, as well as a taper turning attachment.

The saddle is fitted with wide, long bearing surfaces on the ways and a large diameter bearing for the turret. It is equipped with a six-station hollow hexagon turret which is located with a large taper locking pin and held in position with an automatic clamp ring. The saddle has an apron and a sliding gear transmission of nine variable feeds and is equipped with a power traverse which is arranged to provide for two speeds in both directions.



J. & L. saddle-type turret lathe built for heavy duty work

The higher speed is used for the longer travels, such as to and from the work, and the low speed is used for short approach to the work and power indexing the turret. The speed is automatically reduced on the return stroke when it reaches the indexing position. All movements of the power traverse are controlled with a lever located in the center of the star wheel and when the power traverse is engaged the star wheel is automatically disengaged. Six automatic stops are arranged, one for each position of the turret, and three additional manually operated auxiliary stops can be selected for any one position of the turret. All feeds are disengaged against positive stops. Three types of driving units can be supplied—flanged type motor, motor in cabinet leg with V-belt, or a countershaft drive.

This company will exhibit at the Cleveland show.

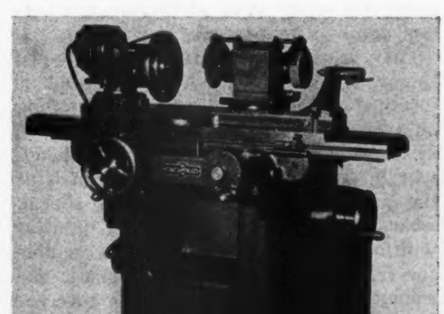
Cutter and Tool Sharpening Machine

The Cincinnati No. 2 plain and universal cutter and tool sharpening machine, built by The Cincinnati Milling Machine Company, Cincinnati, Ohio, has been improved by the adoption of a solid and heavier table slide and by the addition of duplicate operating controls on the left side of the machine when facing the machine from the rear.

In the grinding of large rotary cutters, the solid and heavier table slide reduces vibration to a minimum, resulting in a truer and more even cutting edge. The solid table also permits heavy loading when the table is displaced angularly, as in the grinding of dovetail milling cutters.

The addition of left-hand operating controls increases the adaptability and universality of the machine. Regardless of the type of work, this machine affords a normal operating position. It retains such features as correct location of the work and tooth rest with respect to the right approach to the grinding wheel; unlimited visibility of the work and grinding wheel; accessibility to make changes in the setup and to true the grinding wheel without leaving the operating position and, lastly, safety of operation. No control causes the operator's hands to be placed in dangerous proximity to the grinding wheel. The grinding of left-hand milling cutters and spiral reamers is best handled from the left side of machine when facing the machine from the rear.

This company will be an exhibitor at the Cleveland show.

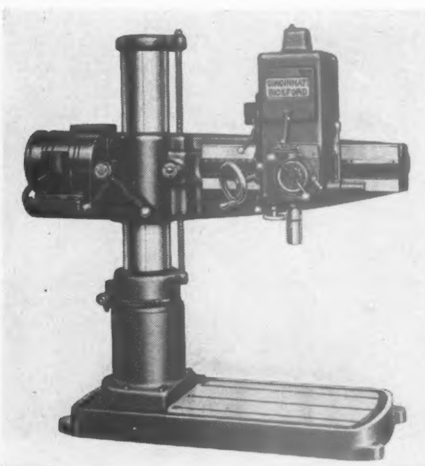


Cincinnati No. 2 cutter and tool sharpening machine

High-Speed Radial Drill

The Cincinnati Bickford Tool Company, Oakley, Cincinnati, Ohio, has just announced the development of the new high speed all-geared radial which is built with either a 3 ft. or 4 ft. arm and a 9 in. diameter column.

Spindle speeds are provided which may be as high as 3500 r.p.m. without the use of belts, all speed changes being made at the head through heat treated alloy steel sliding gears. All nine of the spindle speeds are controlled by a single convenient lever. Feed changes are also made through sliding gears in the head, controlled by a single convenient lever. This machine is equipped throughout with anti-



Cincinnati Bickford radial drill equipped throughout with anti-friction bearings

friction bearings. All shafts are of the multiple integral key type. Lubrication is automatic. The head is fully enclosed, and the arm has a solid rear wall and completely encloses the arm shaft. The arm may be provided with power elevation conveniently controlled by a single fool-proof lever, which is also used to clamp and unclamp the arm to the column. There are automatic safety stops at the top and bottom limits of arm travel.

Easy, rapid handling is obtained by the balanced arm and head. The head is mounted on anti-friction bearings, rolling on a hardened steel arm-way, and is moved at the rate of 3 in. per turn of the handwheel. The feed engagement clutch is of the positive type which will not slip or wear, but which engages at any position with only a fraction of the effort required for friction type clutches. Automatic disengagement of the power feed is governed by setting the graduated dial depth gage. Power feed is automatically disengaged at the top and bottom limits of the spindle travel.

The spindle is of chrome nickel steel and is mounted on precision anti-friction bearings. For accuracy and rigidity the spindle sleeve bearing at the bottom of the head is exceptionally long. The feed rack is an integral part of the spindle sleeve. The spindle and sleeve are counterweighted for fast easy operation.

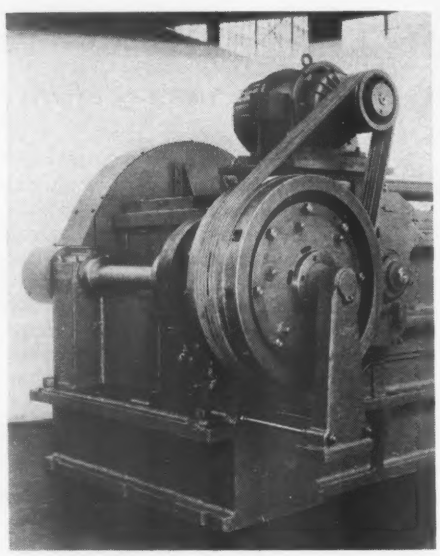
A distinctive feature of this machine is the fact that no forward or reverse spindle driving clutches are required. This is eliminated by the use of a reversing motor. The lever at the lower left of the head operates built-in push buttons, and thus controls the forward and reverse rotation and stopping of the spindle. The spindle reverse through a reversing motor is extremely fast for tapping. All wiring and electrical equipment is furnished by the manufacturer.

This company will be an exhibitor at the Cleveland show.

Air Clutch Forging Machine

The Ajax Manufacturing Company, Cleveland, Ohio, will have on exhibition at the Machine Tool Show an air-clutch forging machine, one of a line consisting of seven standard sizes rated from 2 in. to 7 in. inclusive.

The objective has been a rapid operating machine of greater rigidity and improved alinement, which will both increase outputs and better the quality and uniformity of



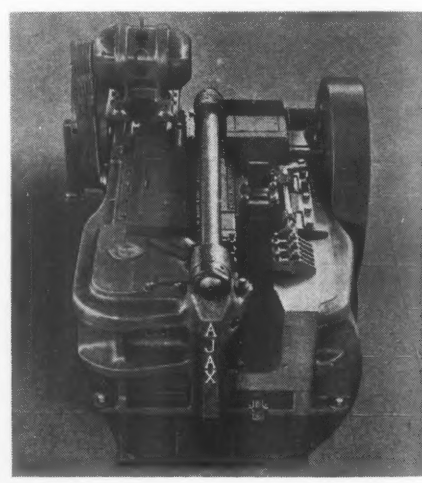
The independent motor drive and clutch mechanism of the Ajax forging machine

the forgings produced. Machines of this air clutch type on actual production are said to have given outputs on the same forging as great as 25 per cent above those of earlier models.

Increased productive capacity is due to the improved operating convenience of the machines generally, and principally to the employment of an air clutch as standard equipment on all sizes. This clutch, a development of The Ajax Manufacturing Company, is housed entirely within the machine flywheel, and consists of a series of large discs, alternately alloy cast iron and friction-material-faced steel, which are forced into contact by the direct action of a piston behind which compressed air is introduced. The pick-up, although instantaneous, is without shock or impact.

Engagement of the clutch is made without fatigue to the operator, calling simply for the opening of an air valve from a conveniently located foot pedal. At a predetermined point in the operating cycle the air is exhausted, releasing the clutch, and an air-released, spring-set brake stops the machine on open stroke. It also serves as an effective, easily and accurately adjustable over-load safety through control of torque capacity by adjusting the air pressure.

The frames of these machines are of steel casting. All sizes have heavy subfloor reinforcement and a large diameter tie rod extending lengthwise and spanning the die slide way. It has been found possible to incorporate in these machines with three main crankshaft bearings the continuous housings and solid sleeve bearings



A top view of one of the Ajax air clutch models

used in the earlier Ajax machines. The pinion shaft is carried in capped bearings to the rear of the crankshaft, where clutch and brake are accessible and disassembly is convenient for shipment or overhauling.

On the 6 in. and larger sizes two-stage gearing is used which permits employment of a main gear and flywheel of moderate size, economizing floor space, and at the same time, due to the higher flywheel speeds, supplying an abundance of energy. The high-speed stage gearing is of the continuous herringbone type running in an oil bath.

The outboard guide of the die slide is located beneath and to the right of the stationary die seat, avoiding a goose-neck effect with its attendant flexibility, and is kept free from water and scale accumulation through the use of protecting shrouds. A take-up is provided on the guide bearings of both slides to offset the wear caused by the highly abrasive steel scale ever present in the atmosphere under operating conditions.

Actuation of the die slide is from com-

plementary cams on the crankshaft, as employed by this company on its models a number of years ago, prior to the period in which drop lock machines were built. The cam slide bridges the crankshaft and cams and houses the return roller support spring and entire die slide safety mechanism. This safety is of the by-pass toggle type, fully automatic and adjustable. The springs are mounted so as to obviate danger from broken spring rods or stripped spring adjusting nuts, and adjustment of the main safety spring is definitely limited so that it cannot be set beyond a safe overload.

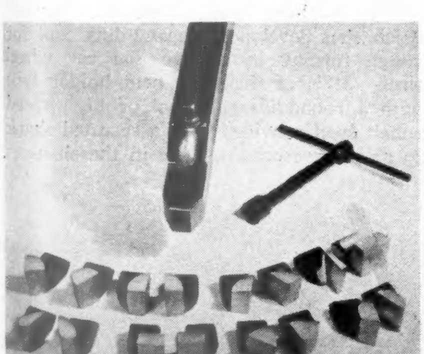
The main toggle pins which operate the die slide are of increased diameter and of the middle-supported type. This prevents bending and places them in quadruple shear, at the same time affording full surface area on the pressure bearing side.

Substantial steel shields completely cover both the cam slide and the crankshaft assembly, not solely for the sake of safety, but to prevent scale and foreign matter from accumulating in these parts. An automatic lubricating system, operating from the crankshaft, is built into the machine as standard equipment to provide lubrication to all except minor points and the anti-friction clutch bearings, which are grease lubricated through Alemite fittings.

Individual motor drive is also provided as standard equipment, the motor being located on a bracket above the left hand crankshaft bearing. Drive to the flywheel is through multiple V-belts.

Improved Cutting Tool Bits

Among the new products of the O. K. Tool Co., Shelton, Conn., are improved lathe, planer and shaper tools. As in previous tools of this type, the bit is separate and adjustable, but the adjustment is



O. K. adjustable tool with separate bits

now accomplished by a system of mating serrations—the same principle employed in their milling cutters.

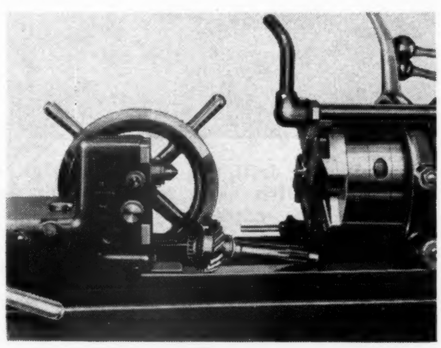
By means of the locking clamp, the tool bit is locked rearwardly against a slanting shoulder, or angular mating surface. This design is said to eliminate sidewise or lengthwise tipping of the tool bit and does not throw the strain onto the locking clamp. By loosening the clamp, the bit may be adjusted laterally to compensate for grinds taken off, or to conform it to the requirements of the work. All O. K. tool bits are so formed, however, that it is seldom necessary to grind more than the top surface. These bits, we are informed, are made of the best high speed steel, drop forged, and carefully heat treated. The holders are made of chrome nickel alloy, drop forged, and specially heat treated for toughness.

This company will exhibit at the Machine Tool Show.

Holding and Centering Attachment

The Landis Machine Company, Waynesboro, Pa., has recently developed a work holding attachment for use on the Landmaco threading machines. The illustration shows a typical example of the work for which the attachment is adapted—in this case, an automobile clutch gear.

On this particular job it was necessary



Landis attachment for concentric threading operations

that the thread be concentric with the gear. In order to maintain concentricity the arrangement also includes a live center supported in the die head. Thus, in effect, threading is done between centers. The work is not rigidly clamped for the threading operation, but is placed by hand over the mandrel and driven by lugs on the mandrel. The mandrel has a hardened and ground locating surface which serves to line up the work for the threading operation.

The live center, which extends slightly beyond the face of the die head, is placed under spring pressure so that as the operator moves the carriage forward in order to bring the position of the work to be threaded adjacent to the chasers, the center moves back into the bore of the head. The center operates in a hardened and ground bushing and has ample bearing surface to insure proper alinement.

The work holding and driving mandrel is applied to a standard carriage front or vise on the Landmaco machine so that it can be applied very readily or removed if the machine is to be used for regular threading work. The live center in the die head and machine spindle are also removable.

Modifications of the attachment shown can be supplied for meeting similar operating conditions.

This company will be an exhibitor at the Machine Tool Show.

Motor-Driven Drill Grinder

A motor-driven drill grinder designed for sharpening straight or taper shank drills, 1, 2, 3, or 4-lip drills, flat or clucking drills, flat twisted drills and drills with over-size shanks has been announced by the Hisey-Wolf Machine Company, Cin-

The Hisey-Wolf grinder will handle drills to 2½ in. in diameter

cinnati, Ohio. It is equipped throughout with ball bearings and provides for adjustable clearance and point angle.

The grinder is regularly supplied with one cup-shaped grinding wheel and one wheel for point thinning. The latter can be replaced with a straight wheel for tool grinding with the use of a tool rest.

The machine illustrated is in two sizes, one end for drills No. 52 to 1¼ in., and the other end from ⅛ in. to 2½ in. diameter drills.

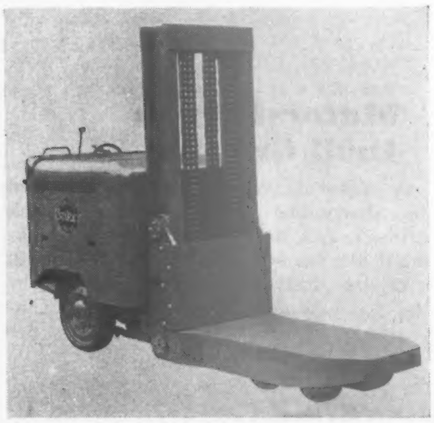
This company will exhibit at the Cleveland show.

Streamlined Hylift Truck

The Baker - Raulang Company, Cleveland, Ohio, has announced a five-ton Hylift truck, the appearance of which is entirely in keeping with the modern trend toward clean design and the elimination of

all sharp angles and unnecessary exterior parts. This is accomplished by placing all of the control and operating mechanism possible within the battery compartment enclosure.

The operating mechanism has been redesigned for greater strength and ease of operation. Hoisting is accomplished by two double alloy steel roller chains, each having a capacity of 46,000 lb., giving a



Baker lift truck which has been redesigned to give greater strength and ease of operation

factor of safety of 9.2 at this point. The hoist unit is a quadruple-reduction spur gear unit with all gears of heat-treated alloy steel and having all shafts either ball or roller bearing mounted. The motion of the platform is protected at both the upper and lower limits of travel by cut-out control switches and further protection is provided by the use of an overrunning clutch in the hoist unit.

The uprights are 10-in. cast alloy steel channels with 1¼-in. thick web and flanges. The platform is fabricated of 1¼-in. high-carbon steel lift arms and carriage electrically welded to a diamond-pattern platform plate. The platform rollers are of heat-treated and ground alloy steel, 7½ in. in diameter, mounted on ball bearings.

The main frame is of ½-in. flame cut high-carbon steel plate with adequate cross members extending from the operator's end of the truck to the uprights. The underframe is built up of two 1¼ in. by 5 in. and two ¾ in. by 5 in. high-carbon steel plates. The dual trailing axle is of alloy steel and is fully compensating, allowing the truck to ride over road obstructions without danger of tipping the load. Each trailing wheel is mounted on two adjustable tapered roller bearings carried on individual knuckles which turn on ball thrust and roller radial bearings.

The steering gear is of the worm and wheel type actuated by a vertical hand wheel. The main steering rods are of heat-treated alloy steel and all clevis connections are fitted with needle bearings which permit the operator to maneuver this massive truck with ease under full load.

The power axle is silent under all load conditions. The duplex compensating suspension is used in this truck and holds the axle in perfect alinement while allowing it to move freely in a vertical direction over rough floors without transmitting road shocks or twisting strains to the frame or steering mechanism.

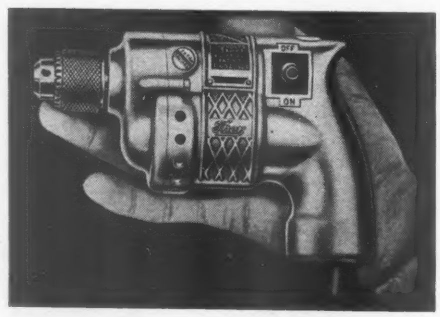
Both the travel and hoist motors are entirely made in the Baker plant especially for industrial truck service and have an overload capacity of 300 per cent of the rated load for 30 min.

This truck can be furnished in any height of lift platform length desired.

This company will be an exhibitor at the Cleveland show.

Electric Drill for One-Hand Operation

The Independent Pneumatic Tool Company, Chicago, has recently announced a Thor light-weight electric drill weighing only 2½ lb., which is adapted to wood and metal work where drill capacities need not



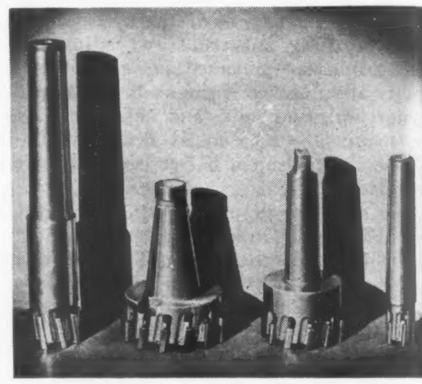
Thor electric drill, 6¾ in. long, weighing 2½ lb., with 3/16-in. and ¼-in. drill capacity

exceed 3/16 in. and ¼ in. This tool is built in two sizes, of the above drilling capacities, each equipped with Jacobs chuck and having free speeds of 2500 and 3750 r.p.m., respectively. Ball bearings and heat-treated helical gears serve to reduce noise, vibration and generated heat to a minimum, the latter factor of importance because the tool, in use, is almost entirely covered by the operator's hand. A patented ventilating system aids in assuring motor operation without over heating. Each of the two models of this tool has an overall length of 6¾ in.

Zee Lock End Mills

The zee lock cutter blade, which was particularly designed by the Ingersoll Milling Machine Company, Rockford, Ill., for use on its face mills, has now been applied to inserted blade end mills. It is positively locked in the cutter body by a zee-shaped wedge. The wedge is shaped so that, in addition to locking the blade, it permits it to be adjusted automatically in two directions; that is, to a great extent outwardly on the diameter, but also a slight amount along the face.

Applied to small end mills, as shown in the illustration, it makes a simple and effective tool. Using renewable cutter



Ingersoll zee lock applied to small end mills

blades of either high-speed steel, Super-Cobalt high-speed steel, "J" metal, or cemented carbide, the cutting edge is of hard and heat-resisting material. The cutter blades are of forged and heat treated chrome molybdenum steel.

End milling cutters as small as 1½ in. diameter are made. Cutters are furnished with blades of suitable thickness or spacing for either roughing or finishing operations. They can be provided with shanks to fit the National standard milling machines, Ingersoll or Seller tapers, etc. Cutter housings with an extended body are obtainable for special operations.

This company will exhibit at the Cleveland show.

Serrated Shank Inserted Tool

The Gorham Tool Company, Detroit, Mich., has developed a heavy duty tool for rough turning locomotive and car wheel tires. It is of the permanent holder type with a round inserted tool of high speed cobalt steel provided with a serrated shank to fit a corresponding hole in the shank.

Gorham heavy-duty turning tool

(*Turn to next left-hand page*)

NEWS

Alonzo G. Pack

Minor Mechanical Meetings

NOT ALL of the minor mechanical department associations will hold meetings in Chicago during September, as announced earlier in the year. According to the latest information available, the Traveling Engineers' Association and the International Railway General Foremen's Association will meet on September 16 and 17 at the Hotel Sherman, Chicago. It is planned to hold meetings of the Master Boiler Makers' Association and the International Railway Fuel Association on September 18 and 19. While some of these meetings will be held simultaneously and all will be at the same hotel, individual meeting rooms will be provided. At the Fuel Association meeting, a total of eight committee reports will be presented and speakers will include prominent representatives of the Federal Co-ordinator, the National Coal Association and railway mechanical departments. No exhibition of railway equipment or supplies is planned in connection with these meetings, which will be strictly business sessions for the purpose of electing officers, receiving and discussing reports, and such other business of the respective associations as may be found necessary.

A. G. Pack Retires; John M. Hall Succeeds as Chief Inspector

ALONZO G. PACK, chief inspector, Bureau of Locomotive Inspection, Interstate Commerce Commission, retired on July 31. John M. Hall, assistant chief inspector, was appointed by President Roosevelt to succeed Mr. Pack and J. B. Brown became assistant chief inspector. The appointments were confirmed by the Senate on August 5.

Mr. Pack entered the service of the bureau as district inspector by civil service appointment in August, 1911. In January, 1914, he was appointed by the President and confirmed by the Senate as assistant chief inspector; he was appointed by the President and confirmed by the Senate as chief inspector effective July 1, 1918. The Bureau of Locomotive Inspection under his direction made an enviable record. The circumstances were not auspicious when he took charge as chief inspector on July 1, 1918, at a time when the condition of motive power was at a low ebb and the force of inspectors seriously depleted due to transfers to other activities. Through the exercise of judicious patience and fair but firm dealing with all concerned Mr. Pack won the confidence and cooperation of the railroad officers and employees, the results of which culminated, in 1932, in the best condition of locomotives in service and the lowest accident rate ever recorded. There has been a slight recession in the condition of locomotives in service and a small increase in the yearly number of accidents since 1932 caused by the desperate situation in which the railroads find themselves, rather than by any diminution of Mr. Pack's efforts or lack of co-operation on the part of the railroads in effectuating the purpose of the locomotive inspection law.

(c) Harris & Ewing
John Brodie Brown

The original Act applied only to locomotive boilers and appurtenances; a subsequent amendment extended the scope to include the entire steam locomotive, and a later amendment included all locomotives without regard to the source of power. Because of the changes of requirements the accident statistics do not lend themselves to ready comparison over periods of years, but the record of boiler explosions or crown sheet failures may be taken as indicative of the improvement in the accident situation. In the fiscal year ended June 30, 1934, as compared with the fiscal year ended June 30, 1912, the first year the boiler inspection act was operative, there was a reduction of 92.6 per cent in the number of accidents, a reduction of 94.8 per cent in the number of persons killed, and a reduction of 89.9 per cent in the number of persons injured.

John M. Hall

A large part of this reduction in boiler explosions was undoubtedly brought about by investigations initiated and conducted by Mr. Pack with respect to the accuracy of boiler water-level-indicating devices. These investigations showed that gage cocks which were entered directly into the boiler gave a much higher reading under certain conditions of operation than the actual water level in the boiler. After this was determined further experiments were made which resulted in development of a water column with gage cocks and water glass attached which overcame the difficulties incident to false indications of water level. A complete account of these experiments together with recommendations in connection with the application of water columns was published in Mr. Pack's report for the year ended June 30, 1920.

Mr. Pack early pointed out and continually stressed in his numerous addresses that a direct relation existed between the condition of locomotives, accidents, and efficiency and economy of operation.

JOHN M. HALL, who has been appointed chief inspector, Bureau of Locomotive Inspection, was born May 20, 1879, in Kent county, Md. He was educated in the public schools and took a course in general mechanical engineering with the Scranton Correspondence School. His entire railroad service was with the Pennsylvania. From 1899 to 1903 he was in the signal department as laborer, signal repairman, and inspector. From 1903 to 1904 he was employed as a brakeman. From 1904 to 1909 he was a locomotive fireman and from 1909 to 1911 a locomotive engineer. On October 9, 1911, he was appointed locomotive boiler inspector, Interstate Commerce Commission, and was assigned successively to three districts, with headquarters at Fort Worth, Tex., Philadelphia, Pa., and the Virginia-Maryland district. On July 13, 1918, he was appointed assistant chief inspector.

JOHN BRODIE BROWN, who has been appointed assistant chief inspector of locomotives, was born May 25, 1881, at Mon-

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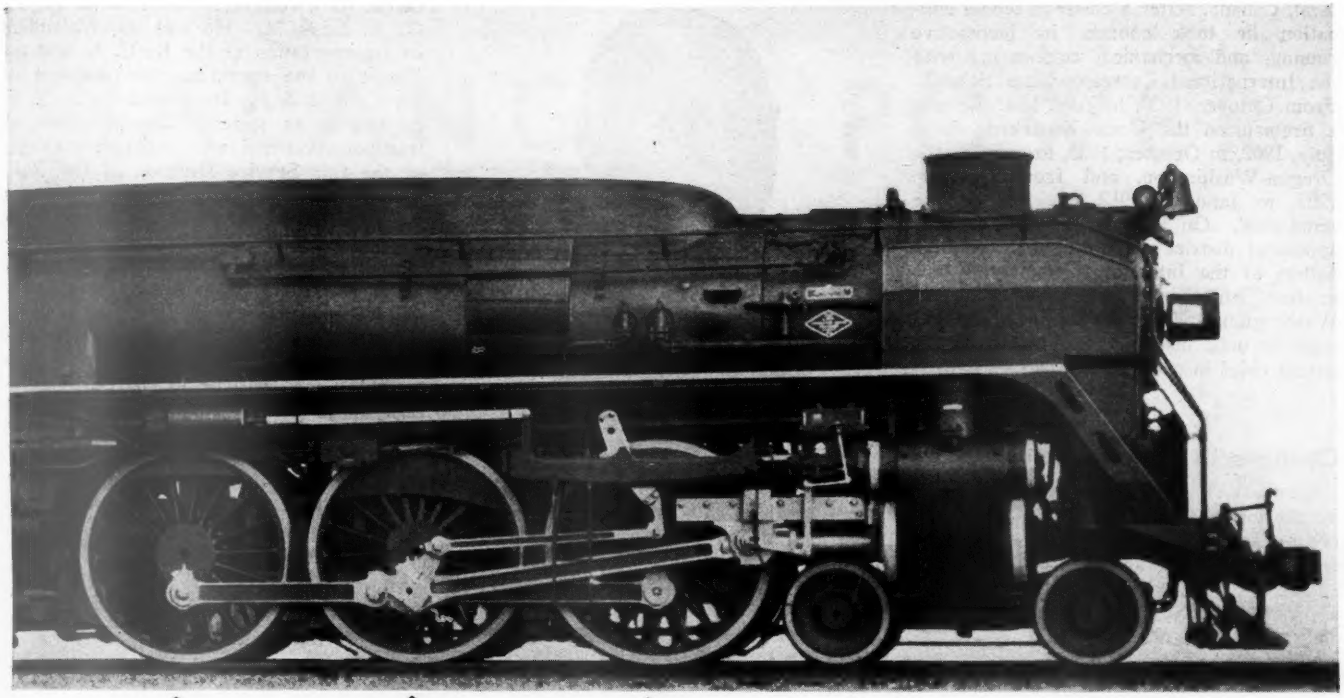

treal, Canada. After a common school education he took courses in locomotive running and mechanical engineering with the International Correspondence Schools. From October, 1900, to July, 1902, he was a fireman on the Great Northern; from July, 1902, to October, 1905, fireman on the Oregon-Washington, and from October, 1905, to January, 1912, engineer on the same road. On January 16, 1912, he was appointed district inspector of locomotive boilers of the Interstate Commerce Commission, for the district of Oregon and Washington, and he has continued in that capacity until his new appointment as assistant chief inspector.

Changes in Co-Ordinator's Staff

Co-ordinator Eastman has announced a number of changes in his staff, partly because of changes in future work and partly because of vacancies.

The Section of Purchases will be given a broader field of activity, and its name changed to the Section of Property and Equipment. It will continue under the direction of R. L. Lockwood. In addition to the work which that section has heretofore carried on, directed toward the better handling of purchases, stores and scrap, and progress in standardization, simplified practice and central scientific research, it has been given the duty of concentrating on the "container problem," and also on the better utilization of shops and shop equipment.

By the "container problem" is meant the securing of equipment, interchangeable in use between all railroads and trucks and water lines as well, which will meet the needs of modern commerce for convenient and speedy transportation of lots intermediate between package freight and carloads, providing complete door-to-door service at the equivalent of carload rates or rates near that level. Attention will be given primarily to the needs and desires of shippers and consignees, and then to the best means of meeting those needs and desires. The problem involves not only equipment design but also questions relating to service and rates and to co-ordination of rail and truck operation. Mr. Lockwood will have the help of other sections of the Co-ordinator's staff in this work, and also in his work on the utilization of shops and their equipment.

N. D. Ballantine

N. D. Ballantine, heretofore assistant director, has been promoted to the position of director of the Section of Car Pooling, made vacant by the resignation of O. C. Castle, but, pending information as to the actual results of the new plan of per diem payments adopted by the Association of American Railroads to reduce empty car mileage, car pool plans will not be pushed. In the meantime he will lend assistance to the Section of Property and Equipment and the Section of Transportation Service. Mr. Ballantine, one of the outstanding students of the subject of car pooling, was born in Booneville, Mo., in 1872 and began his railroad career as a telegraph operator on the K. C., F. S. & M. He was superintendent of transportation of the K. C. S. and assistant to the operating vice-president of the C., R. I. & P. He served the A. E. F. in France as general superintendent of transportation and was assistant manager of the Car Service Division of the Railroad Administration in Washington for a year. He then became superintendent of transportation of the U. P. and later assistant to the president of the S. A. L. In recent years he has been a transportation consultant.

In the Section of Transportation Service the work will be divided between two co-directors, who will be in charge of separate matters but will consult and work together. One of these co-directors will be John C. Emery and the other Joseph L. White. Mr. Emery will deal primarily with matters relating to passenger and merchandise traffic, and Mr. White with matters relating to freight carload traffic. John C. Emery has been connected with the Railway Age since 1922, after several years of experience in railroad service which included work on the Chicago & Alton, Kansas City Terminal and Canadian Pacific. Joseph L. White was formerly assistant to the director of the Division of Transportation Loans, Federal Emergency Administration of Public Works. His previous railroad service had been on the Grand Trunk, Wabash, Chicago, Indianapolis & Louisville, Union Pacific and the United States Railroad Administration.

Further information furnished by the editor upon request

Mechanical Drawing Standards

For the purpose of setting up standards of practice to be followed in the preparation of mechanical drawings, a graphical "dictionary" of drawings has been developed, according to an announcement by the American Standards Association, which has adopted the new work as standard. The preparation of the dictionary was sponsored by the Society for the Promotion of Engineering Education and the American Society of Mechanical Engineers, the work being done under the direction of a committee of the A. S. A., of which Dean Franklin DeR. Furman of the Stevens Institute of Technology was chairman. Subcommittees undertook studies on the various phases of the subject, such as specifications for paper and cloth, methods of indicating dimensions, lettering, drawing layout, line work and graphical symbols for drawings. Questionnaires were sent to 900 organizations interested in mechanical drawing asking for details as to individual practices, the returns being codified and used as the basis for the first draft of the standard.

Demands Slowing Down of High-Speed Trains

A Petition has been filed with the Illinois Commerce Commission by the alderman of the forty-first ward, Chicago, seeking to prohibit streamlined trains from traveling at high speeds through urban residential districts and demanding a 30-mile-an-hour speed limit within the city.

(*Turn to next left-hand page*)

Supply Trade Notes

BRAMAN S. ROCKWELL has been elected executive vice-president of the Illinois Railway Equipment Company, Chicago.

THE YOUNGSTOWN SHEET & TUBE COMPANY, Youngstown, Ohio, has about completed work on a new continuous cold strip mill which is being built as an adjunct to its new hot mill.

ARTHUR D. HEFFRON, JR., sales supervisor of the Globe Steel Tubes Company, Milwaukee, Wis., has been appointed manager of sales of the Cleveland district, with headquarters at Cleveland, Ohio.

J. R. C. HINTZ has been appointed railway sales division manager, with headquarters at Detroit, Mich., in charge of sales to railways of paints manufactured by Detroit Graphite Company, Detroit, and car finishes manufactured by Valentine & Company, New York.

WILLIAM J. HAMMOND, traffic manager of the Inland Steel Company at Chicago, has been promoted to the position of vice-president in charge of railroad sales to succeed Charles R. Robinson, who has been elected first vice-president and general manager of sales. Ralph R. Flynn, assistant traffic manager, succeeds Mr. Hammond as traffic manager. Mr. Hammond began his business career in 1901 as a clerk in the freight office of the Illinois Central at Chicago and held various positions with that road until 1911, when he was appointed contracting freight agent. The following year he left that service to take a similar position with the Union Pacific. In 1913 he was appointed traveling freight agent and in 1917 eastern car service agent. Mr. Hammond entered the employ of the Inland Steel Company in 1918, as assistant traffic manager, and in 1926 was appointed traffic manager.

JAMES R. FITZPATRICK has been appointed director of sales of the Technical Division of the Algoma Plywood & Veneer Company, with headquarters for sales, research and engineering service at 1616 Builders Building, 228 North La Salle street, Chicago. The main plant and factory of the Algoma organization is located at Algoma, Wis., where it has been in business more than 60 years. It has recently installed what is said to be the world's largest hot-plate press, capable of producing waterproof, resin-glued panels in 12-ft. widths and in any length and thickness. Because of the size to which these panels can now be manufactured, they will be of special interest to builders of truck and bus bodies, street cars and railway coaches. The large sizes can be used for an entire top, side or end wall lining, and even for flooring. The Technical Division which Mr. Fitzpatrick will head is entirely separate from the Algoma general organization, although closely affiliated with the parent company, and will function as an individual organization. The purpose of this division is to open up new fields for the use of plywood in large panels and to promote uses for plywood combined with other materials, such as stainless steel and copper sheets and composition insulating boards.

Mr. Fitzpatrick is a graduate of the Rensselaer Polytechnic Institute and has served as a trustee of that institution. For 12 years he has been vice-president in charge of sales for the Haskelite Manufacturing Corporation. He is a member of the Engineers' Club of New York, the Society of Automotive Engineers, the American Society of Civil Engineers, and is an associate member of the Society of Naval Architects and Marine Engineers. Recently he has served as a member of the executive committee of the American Transit Association and as chairman of the Manufacturers' Section of the Automobile Body-Builders Association.

William J. Hammond

Wallinger

James R. Fitzpatrick

L. R. GURLEY, who has joined the Chicago advertising staff of the Simmons-Boardman Publishing Company, was graduated from the University of Pittsburgh in 1920 and subsequently from the special apprenticeship course of the Pennsylvania. He later served as a motive power inspector and in the office of the superintendent of motive power of that road at Pittsburgh, Pa. In May, 1924, he joined the editorial staff of the Railway Age and the *Railway Mechanical Engineer.* In September, 1929, he resigned to become editor of a new publication called Welding, a magazine published by Steel Publications, Inc., Pittsburgh, Pa., and from September, 1933, till December, 1934, he was western manager of the Chicago territory for that company.

THE AIR REDUCTION SALES COMPANY, New York, has moved its Portland, Ore., headquarters from Third and Glisan streets to 13 Northwest Fourth avenue to provide increased space and demonstration facilities for its products. The company has also established new offices for supplies at 336 Spring street, N. W., in Atlanta, Ga., and at 18-20 North Cheyenne avenue, in Tulsa, Okla.

Obituary

W. L. JEFFERIES, JR., sales representative at Richmond, Va., of the Union Spring & Manufacturing Company, New Kensington, Pa., died on August 8.

S. A. WITT, for many years western manager of the Detroit Lubricator Company at Chicago, and well known in the railway supply field, died on August 10, after about a year's illness.

PAUL J. KALMAN, representative of American Steel Foundries, Chicago, with headquarters at St. Paul, Minn., since 1905, and chairman of the Bliss & Laughlin Company, Harvey, Ill., and the Globe Seamless Steel Tube Company, Milwaukee, Wis., died in St. Paul on August 8 after a year's illness.

B. HYANES, service engineer at Baltimore, Md., of the New York Air Brake Company, died on August 9. Mr. Hyanes was born in August, 1867, at Churchville, N. Y., and started railroad work on the Northern Pacific in 1884, as locomotive fireman, later becoming engineman. In 1895 he went to the Chicago & Alton, leaving that service in 1902 to join the New York Air Brake Company.

MAURICE L. BURGHAM, sales engineer for the past nine years of the Edgewater Steel Company, Pittsburgh, Pa., died on July 19 in that city, after an illness of two months. Mr. Burgham was born on April 3, 1901, at Parnassus, Pa. In 1923 he was graduated from the University of Pittsburgh, in the school of engineering. He held a second lieutenancy in the Officers' Reserve Corps of the U. S. Army.

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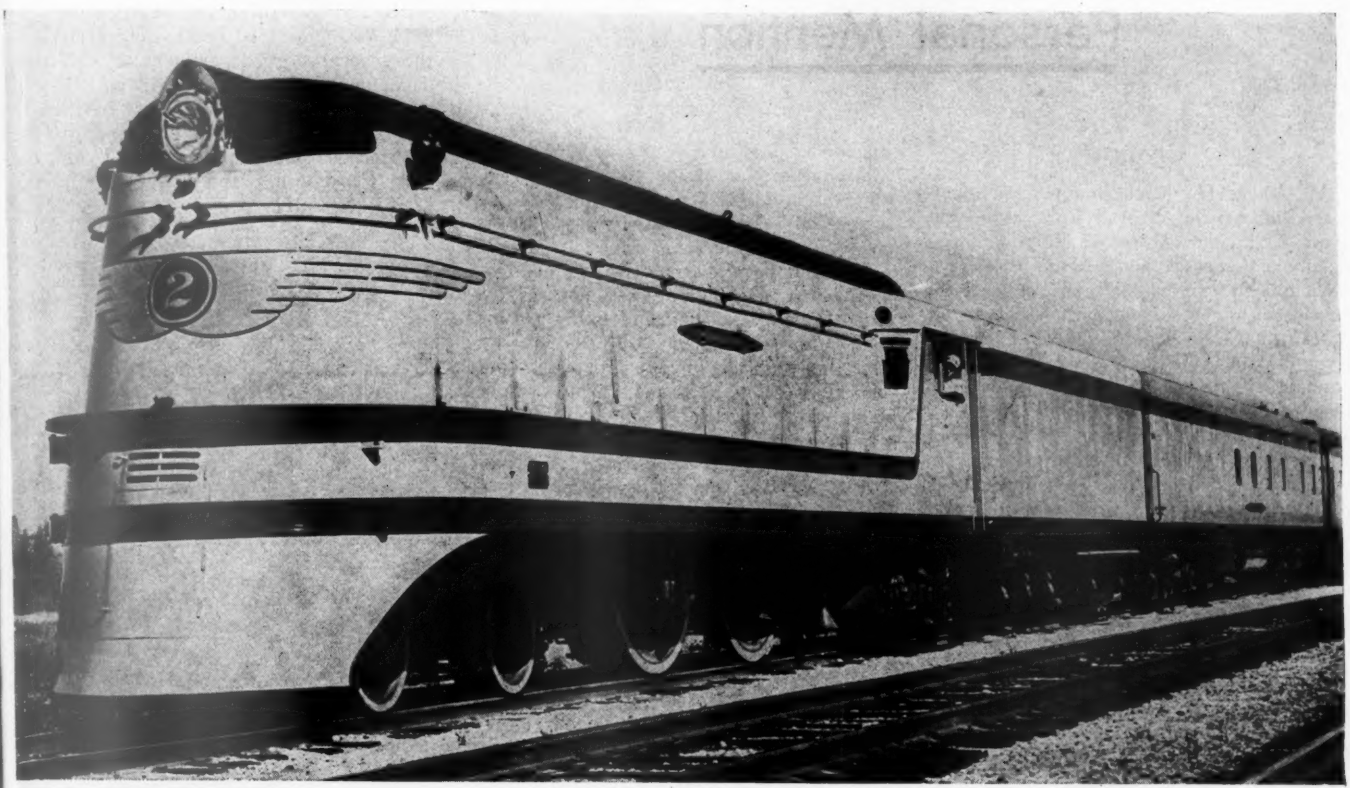

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A SAFEGUARD AGAINST HIGH MAINTENANCE

ALCO Forgings are the best safeguard against high machine shop and back shop costs. They reduce all classified repair costs because long experience with thousands of ALCO-built locomotives demonstrates that ALCO Forgings go on working from shopping to shopping before renewals or retruing are necessary. They not only protect engine service and availability under high speeds and intensive utilization but also prevent costly engine failures.

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AMERICAN LOCOMOTIVE COMPANY
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30 CHURCH STREET · NEW YORK · N·Y·

Personal Mention

General

W. A. Hurley has been appointed superintendent of the Boston division of the New York, New Haven & Hartford, with headquarters at Boston. Mr. Hurley was born on August 15, 1889, and entered the service of the New York, New Haven & Hartford in November, 1909, as a locomotive fireman. He became an engineer in January, 1918, and in 1923 became smoke inspector. In 1924 he was appointed road foreman of engines and in 1925 assistant trainmaster of the Boston division. He was appointed assistant superintendent of the Boston division at Boston in 1927 and was later transferred to the Old Colony division at Taunton, Mass., to the Midland division at Framingham, Mass., and in 1931 he returned to Boston as assistant superintendent of the Boston division.

W. A. Hurley

Sixto Martinez, superintendent of shops of the National Railways of Mexico, with headquarters at Aguascalientes, Ags., Mex., has been promoted to superintendent of motive power and machinery. He was born at Monterrey, Nuevo Leon, on March 28, 1887, and entered railway service on July 1, 1900, as an assistant mechanic for the National Lines at Monterrey. Later he was employed as third-class mechanic at Monterrey, second-class mechanic at Dona Cecilia and first-class mechanic at Monterrey. On December 1, 1907, he was appointed enginehouse foreman at Saltillo, and, after serving as foreman at other enginehouses and repair shops, was appointed master mechanic at Monterrey on September 1, 1914. On February 1, 1919, he was appointed assistant superintendent of motive power and on November 5, 1927, he was appointed superintendent of shops at Aguascalientes.

Sixto Martinez

Boiler Shop

B. C. King, assistant general boiler inspector on the Northern Pacific, with headquarters at Auburn, Wash., has been appointed general boiler inspector with system jurisdiction and headquarters at St. Paul, Minn., succeeding J. J. Davey, who has retired after 49 years of continuous service with this road.

Purchasing and Stores

V. R. Naylor, district material inspector on the Southern Pacific at Sacramento, Cal., has been appointed to the newly created position of general inspector of stores, with headquarters at San Francisco, Cal.

E. C. P. Cushing, purchasing agent of the Canadian Pacific at Vancouver, B. C., has been transferred to Winnipeg, Man.

S. V. T. Jeffery, purchasing agent of the Canadian Pacific at Winnipeg, Man., has been transferred to Vancouver.

Obituary

R. B. Rasbridge, who retired as superintendent of the car department of the Reading in 1932, died on August 2.

Frank C. Shepherd, consulting engineer of the Boston & Maine, with headquarters at Boston, Mass., died on August 6 at his home in Chestnut Hill, Boston. Mr. Shepherd was 64 years old.

Robert D. Crawford, general storekeeper of the International-Great Northern and Gulf Coast Lines at Palestine, Tex., died on July 30. Mr. Crawford was born on November 28, 1888, at Franklin, Tex., and received a high school education. He entered railway service in 1906 as clerk in the local freight office of the International & Great Northern (now the International-Great Northern) and until 1910 was employed in minor positions in the general offices of the mechanical department and general store department. In 1911 Mr. Crawford became chief clerk in the general store department at Palestine, Tex., and from 1912 to 1915 was district storekeeper at Palestine, Tex. In 1918 he was appointed general storekeeper of the International-Great Northern road, the Gulf Coast Lines and the San Antonio, Uvalde & Gulf.

Robert D. Crawford

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

General Service Locomotives.—The Sentinel Wagon Works, Ltd., Westminster, London, England, has issued a well-illustrated descriptive catalog covering the line of Sentinel General Service Locomotives. The loose-leaf pamphlets cover general descriptions, performance, engines, running gear, controls and boilers which are of the Woolnough, high-pressure, water-tube type. These locomotives are available in several sizes up to 600 brake horsepower.

Tight-Lock Couplers.—An interesting 28-page booklet, covering O-B tight-lock couplers and automatic train-line connectors has recently been issued by the Ohio Brass Company, Mansfield, Ohio. This illustrated booklet, called Bulletin 612-A, presents in concise form the general construction and advantages of O-B tight-lock couplers. Coupler and train-line connector details, as well as the method of uncoupling, are included. The last few pages of the bulletin contain excerpts from the Railway Age issue of May 4, which describe the installation of O-B tight-lock couplers and train-line connectors on the new streamlined Baltimore & Ohio trains, and on the Gulf, Mobile & Northern high-speed three-car non-articulated Diesel-electric train.

Railway Mechanical Engineer

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Railway Mechanical Engineer

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WINE DROP END LOCK FOR GONDOLA CARS

WITH STURDY RUGGED INTER-LOCKING TOP CORNER

AS RIGID AS A SOLID END CAR

THE WINE RAILWAY APPLIANCE CO. TOLEDO, OHIO

October, 1935

35¢

VOL. 109 No. 10

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